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ABSTRACT

This book is the third in a series of discussion materials, this issue being part of an action project to increase environmental awareness. Over 60 readings are included that cover a wide variety of opinions and interpretations of specific environmental problems and related philosophic issues. Examples of topics discussed include population, land use, urbanization, consumer needs and welfare, pollution, technology, and energy crisis. Authors such as John Quincy Adams, Arnold Toynbee, Henry David Thoreau, and others add historical background to current problems. (LS)

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Make Up Your Own Mind

Book III

QUALITY of LIVING:

Environmental Viewpoints

(to read and discuss with other concerned humans)

**Edited by, and Introduction by,
Adamantia Pollis, Ph.D.**

*American Institute of Discussion
Oklahoma City, Oklahoma*

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Quality of Living is Book III in a series of readings for discussion entitled **MAKE UP YOUR OWN MIND** published by the American Institute of Discussion.

The cost of developing these discussion materials was partially underwritten by a grant from the U.S. Office of Environmental Education. The book is a key part of a discussion/action project in environmental awareness launched in the summer of 1973 through television programs and group discussions.

Effective use of the book as a vehicle for discussion of the issues can be enhanced by techniques developed and honed over the years by the American Institute of Discussion, Box 103, Oklahoma City, Oklahoma 73101.

Cover design by Bill Cason

Contents

1. INTRODUCTION, <i>Dr. Adamantia Pollis Ph.D.</i> (The Quality of Living).....	1
2. MAN AND HIS ENVIRONMENT (Act Nature-Ally)	
Nature and Pre-Industrial Man, <i>Jean Dorst</i>	4
The Worship of Nature, <i>Arnold Toynbee</i>	6
Man's Mission—Subdue the Earth, <i>John Quincy Adams</i>	9
The Natural Life, <i>Aime Cesaire and Charles Eastman</i>	9
Man's War With Nature, <i>Eric Hoffer</i>	11
A Bill of Rights for All Living Things, <i>Jean Mayer</i>	12
Unity of Man and Nature, <i>Rabindranath Tagore</i>	15
The Goals of Man, <i>Henry David Thoreau</i>	17
3. POPULATION, RESOURCES AND THE GOOD LIFE (People! Who Needs 'Em?)	
The Misery of Mankind, <i>Robert Malthus</i>	19
The Hope for Mankind, <i>William Hazitt</i>	21
Population Growth and Human Welfare, <i>Pope John XXIII</i>	23
Population Control for Underdeveloped Countries, <i>Robert S. McNamara</i>	24
A Technology for the Earth's Poor, <i>Ivan Illich</i>	28
Economic Impact of Zero Population	31
Poverty Amidst Plenty	33
4. TECHNOLOGY AND THE USES OF MAN (Is More Better?)	
Resources and Wants, <i>C. E. Ayres</i>	36
A Fundamental Extension in Morality, <i>Garrett Hardin</i>	38
Is More Better?, <i>Russell E. Train</i>	42
National Goals and National Welfare	43
The Poverty of Physical Abundance, <i>Robert Theobald</i>	45
Limitless Expansion, <i>Albert J. Beveridge</i>	46
Neutral Science, <i>John Burroughs</i>	48
Technology for What?, <i>Lewis Mumford</i>	49
5. LAND USE AND THE GOOD LIFE (Living Off the Land)	
The Joy of Preserving Nature, <i>John Muir</i>	53
Man's Needs and Deforestation, <i>Jean Dorst</i>	55
The Environment is Man's Home, <i>Arthur Glickson</i>	57
Land for All Things, <i>Russell A. Brown</i>	59
The Wasteland, <i>Robert A. Curry</i>	62
Timber for Housing, <i>Robert V. Hansberger</i>	63
6. THE CITY AND THE GOOD LIFE (Cities! Who Needs 'Em?)	
Beauty vs. Utility, <i>Charles Dickens and</i> <i>Alfred Russell Wallace</i>	66
What Is a City?, <i>Lewis Mumford</i>	69
Adaptability to the City, <i>Rene Dubos</i>	70
The City is Progress, <i>Eduard C. Banfield</i>	72
How Many People?, <i>E. T. Hall</i>	74

How Much Noise?, <i>Mark O. Hatfield</i>	76
Culture for the Many	78
An Alternative Life Style, <i>Hans Sachs</i>	79
7. THE ECONOMICS OF POLLUTION CONTROL	
(Pollution, the Problem For Somebody Else)	
Pollution vs. High Standard of Living, <i>William B. Johnson</i>	80
Pollution a Symptom—Not a Cause, <i>Barry Weisberg</i>	82
How Much Must Consumers Pay?, <i>John T. Connor</i>	84
The Cost of Pollution, <i>Ron M. Linton</i>	86
Inflation and Water Pollution, <i>Richard M. Nixon</i>	88
Consequences of Pollution Control, <i>M. V. Anthony</i>	89
The Economics of Recycling Waste Materials, <i>M. J. Mighdoll</i>	91
8. CONSUMER NEEDS AND HUMAN WELFARE	
(The Consumer, Victim or Villain?)	
Health and the Science of Ecology, <i>Rene Dubos</i>	94
Consumer Food Choices, <i>Leon P. Ullensvang</i>	95
Organic Foods and Health, <i>Robert Rodale</i>	97
Cars and Mobility, <i>Allan T. Demaree</i>	99
Health and Auto Pollution, <i>P. B. Hammond and Samuel Lenher</i>	101
Who Wants Protection?, <i>Richard W. Darrow</i>	105
The Pollutionist Movement, <i>John Kenneth Galbraith</i>	105
9. ENERGY—THE FOUNDATION OF INDUSTRIALIZED SOCIETIES (Energy Crisis?)	
Energy Policy and a High Standard of Living, <i>John G. McLean</i>	108
Nuclear Energy—A Solution to the Energy Crisis, <i>Wilfred E. Johnson</i>	112
Restrict Energy Use, <i>Michael McClosky</i>	114
Costs of Public Energy Demand, <i>C. Howard Hardesty, Jr.</i>	117
Strip Mining Destroys Environment, <i>Ken Hechler</i>	122
Why Fusion?, <i>William C. Gough</i>	124
10. NATIONAL SECURITY AND ENVIRONMENTAL IMPACT	
(Controlled Environment?)	
Chemical and Biological Testing for Deterrence, <i>Henry Reuss and Richard McCarthy</i>	126
Environmental Impact of Nuclear Test.....	128
National Interest and Atomic Tests, ...	129
The Modification of Our Weather, <i>Herman Pollard and Robert M. White</i>	130
Weather Modification and Environmental Destruction, <i>Gilbert Gude</i>	134
Weather Modification and Defense, <i>John S. Foster, Jr.</i>	135
Ecological Warfare, <i>Richard A. Falk</i>	136

PREFACE

Book I and Book II in this series provided a wide spectrum of opinion and interpretations of contemporary issues of vital concern to the American public. Book III, *The Quality of Living*, continues this tradition. It deals with specific environmental problems of the day within the larger context of fundamental and enduring philosophic issues. In so doing, it presents persons of widely divergent views from both the public and private sectors.

The initial selection of the readings was made by the editor with the able and indispensable assistance of Arthur Dunkleman. Without his grasp of ecological issues, his perusal of a mass of materials, his competence in library research, and his dauntless perseverance, it is doubtful this project would have been completed, certainly not within a reasonable time span.

Particular thanks and an expression of appreciation are due Daniel Blanchard, Executive Director of the American Institute of Discussion, and Dr. Walter Gray, Jr. Their suggestions, the thoroughness with which they reviewed the selections, and their steadfast insistence that all sides of an issue be fairly presented, were invaluable. The dedication and capability of the A.I.D. Board of Trustees are truly impressive. Each of them has worked hard on this book.

ADAMANTIA POLLIS, PhD

FOREWORD

When the American Institute of Discussion (A.I.D.) decided to embark upon this environmental project, the question of who would edit the book of readings to be known as Book III proved to be an easy question to answer: it was natural that A.I.D. would turn to the editor of Book II, which has provided outstanding discussion material on contemporary issues since its publication in 1966. Dr. Adamantia Pollis evidenced first-rate scholarship and judgment in editing the earlier book and she has first-hand knowledge of the discussion process.

Dr. Pollis is a member of the Graduate Faculty of The New School for Social Research, New York City, the largest adult education institution in the nation. Respected as a professor and researcher, Dr. Pollis holds a B.A. degree from Hunter College, where she later served on the faculty, an M.A. in economics and a doctorate in political science from Johns Hopkins University.

She is A.I.D.'s academic director and a member of its Board of Trustees.

Her colleagues on the A.I.D. Board of Trustees represent a wide variety of professions and lines of work: lawyers, engineers, ministers, accountants, educators, business persons, medical doctors, researchers, *et al.* Their viewpoints cover a broad political spectrum

and their interests differ greatly; but, all of them share a major interest: the free discussion of significant issues.

The Board of Trustees took the lead in this environmental awareness project. Innumerable small-group meetings were held initially by Dr. Pollis with moderators, discussants, experts, active laymen and other civic leaders. These meetings succeeded in delineating problem areas and in obtaining valuable suggestions. When partial funding for this project was obtained from the U.S. Office of Environmental Education, a pilot discussion course was conducted. This was in the fall of 1972. Dr. Pollis played a pivotal role in the development and testing of the pilot course as she has in subsequent stages of the project. Trustees and others critiqued readings as they were compiled to determine the quality of the readings as discussion vehicles. A conference that attracted trustees and others interested in A.I.D. was held February 1-2, 1973, at Fountainhead Lodge, Oklahoma. This conference proved to be a catalyst for the final preparation of the book and the planning of the project. In fact, *Quality of Living*, is a genuine distillation of a wide variety of citizen input.

The project is geared to the creation of greater "environmental literacy." To carry out this goal, A.I.D. used not only reading and discussion groups but also television programming which covered in individual programs each of the topics addressed in these readings. The television portion of the project, in the summer of 1973, was made possible through the contribution of television production and public service broadcast time by WKY-TV, Oklahoma City.

Although literally dozens of persons across the nation participated in the unfolding of "*Quality of Living*," the undersigned wishes to acknowledge especially his gratitude to the following: Walter Gray, Jr., Director of the Community Workshop of the Oklahoma County Libraries, who gave so much time and expertise in discussion and in television production; Joe Jerkins, Program Director of WKY-TV, who showed great professional imagination and contributed his time so generously; Duane Meyers, who coordinated the dissemination of news about the project; also, Dr. LeRoy Carpenter, Oklahoma State Commissioner of Health, Doyle Caton of the Environmental Information Center at East Central State College in Ada (Okla.), and Sandra Briggs of the Community Workshop of the Oklahoma County Libraries, all of whom were instrumental in arranging for panelists on the television programs.

To those and to the organizations they represent, to the Office of Environmental Education, to the many civic leaders and organizations who have joined together in this vital project, our heartfelt appreciation.

DANIEL L. BLANCHARD,
Executive Director
American Institute of Discussion
Oklahoma City
April, 1973

1

The Conservationist: "The World's finite resources are scarce."

The Technologist: "Knowledge is power and the sky's the limit."

—Kenneth Boulding

"Dehumanization means the reclamation of man by nature."

—Eric Hoffer

"The highest purpose of this world is not . . . making use of it . . . not alienating ourselves from it, but comprehending it and uniting it with ourselves in perfect union."

—Sir Rabindranath Tagore

"The plain fact is that the overwhelming majority of city dwellers live more comfortably and conveniently than ever before."

—Edward C. Banfield

"American cities give the impression of being more crowded . . . because they expose their inhabitants to many more unwelcome stimuli. Much of the experience of crowding comes not from contacts with real human beings but from the telephones, radios, and television sets that bring us the mechanical expressions of mankind instead of the warmth of its biological nature."

—Rene Dubos

"The average American has no desire for — and . . . little interest in — all the over regulation, super regulation, and bery of restrictions that masquerade today under the soul-stirring symbols such as truth in lending, truth in packaging, truth in just about everything."

—Richard W. Darrow

"Science and technology may, through its inordinate growth, become increasingly irrelevant to any human needs, except that of the technologist or the corporate enterprise."

—Arnold Toynbee

Introduction *by Adamantia Pollis, Ph.D.* *(The Quality of Living)*

All societies, from the most primitive to the most industrialized, have underlying philosophic precepts regarding the nature of man and his relationship to nature and to the universe. The basic tenets of the modern world, until recently, have gone unchallenged. Modern society and, by extension, modern science view man apart from nature; man is a creature endowed with reason and logic who can control and manipulate his environment for his own purposes, be it war or a high standard of living. Isolated, dissident voices, protesting the ways of modern mankind and forecasting doom, have been voices in the wilderness.

An admonition uttered by the philosopher of modern science, Francis Bacon, "nature to be commanded must be obeyed," by and large has gone unheeded. In recent years, the unintended consequences of applied scientific knowledge and of technological developments are beginning to shatter faith in the unquestioned verities. The society man has created seems to be turning on him and threatening his survival. With bewilderment, man asks "has nature been obeyed?" The environmental problems of the current era can not be ignored; some, such as water and air pollution, have already reached crisis proportions; others, such as energy shortages, are threatening to become critical. In turn, these crises have evoked concern about the quality of man's total environment; the additives in the food he eats, the eyesores of the countryside, the ugliness of the cities and towns he inhabits. As the quality of living has come under scrutiny, philosophic questions, assumed to have been settled long ago, are disturbing our equanimity. Doubts have arisen regarding the desirability of an industrialized society; questions are raised regarding the proper ends of scientific knowledge; the whole question of the proper priority of values is being scrutinized anew.

Historically, Americans have believed that the good life for the individual, for the group or for an industrial enterprise, is attainable by each pursuing his own particular end; the self-definition of welfare unfettered by governmental constraints. In turn, Americans have shared the view that the quality of life depends on material well-being and aggrandizement. The goals have been largely economic: profits for corporations and accumulation of consumer goods for individuals. Conventional wisdom has dictated that the summation of individual welfare equates welfare for all. Society's progress is measured by the rate of growth and by increases in the gross national product. In point of fact, historically, rampant

2 INTRODUCTION

individualism has been curtailed and, as social problems have emerged beyond the capacity of the individual or the group to deal with, government has intervened and regulated or controlled in the name of social welfare. Hence the government today, be it at the county, state or federal level, provides many services and regulates many areas of our daily life. Nevertheless, the notion of individual pursuit of self-interest has remained a basic commitment of Americans as has the belief in progress defined in terms of technological know-how.

In recent years, a new challenge has presented itself to the American philosophic credo and its economic principles. According to some, the environment created by man is threatening to destroy man and his civilization. The very developments which were to improve our lives have in turn created health hazards; man has been exposed to new strains and stresses with adverse physical and psychological effects; the chemical additives and preservatives in our food, be it fresh or canned, may be endangering our health, the air we breathe, the water we swim in, the fish we eat, all potentially may be poisonous. The industrial and consumer waste products we produce clutter and pollute the environment. On the other hand, essential resources, it is claimed, are rapidly being depleted: land, energy, forests. The ecological problems seem endless and confront man with the question: what is to be done?

For others, the technology and the values on which it is predicated have enabled the freeing of man from exclusive preoccupation with physical survival, with food and shelter. His basic needs satisfied with less effort, the individual can fulfill his potential unhampered by grinding poverty and decimating illness; he can enjoy longer life, he can pursue his interests, be they sports, reading, art or music. Man's creativity has more fertile ground for expression. It is not just the affluent few, but the many, who enjoy material goods and the comforts which the science and the technology of modern industrial society make possible. It is in underdeveloped Africa and Asia that there are still teeming millions of the ill-clothed and the ill-fed. Mass production gives to the many the material comforts which in by-gone eras were the prerogatives of the few. It gives them both the tools — the mass media, the books, the records — and the leisure time, for knowledge. Preservatives enable the storage of food and its transportation over long distances. Urbanization gives the many access to the museums, the theater, the concerts — it makes a society's culture a part of the individual's life.

Still the environmental problems facing Americans today are manifold and complex; questions on priority of values, on alternative life styles, scientific questions on what the issues are and on possible "scientific" solutions; questions on the political and economic consequences of various proposed solutions; questions on the physical and psychological consequences of alternative solutions. There are those who contend that our ecological problems are a direct consequence of the American economic and political system. Yet, environmental issues are international in scope. Not only do they manifest themselves independent of ideology or social

and economic system, but environmental problems in one locale ramify in widely dispersed geographic areas. Nature knows no geographic boundaries and nature knows no ideological controversies. Deforestation, erosion, air and water pollution exist in country after country, whether they have a free enterprise system or a socialist system. Lake Baikal in the Soviet Union has been as polluted as the lakes in the United States. The air over Tokyo is as polluted as the air over New York, Los Angeles, Mexico City or Leningrad. Environmental problems are characteristic of modern industrial society rather than of any particular social, political or economic system. It is perhaps the universality of the value of material wealth and the neglect of other values that have precipitated man's ecological problems. Yet it may well be that ecological problems are a small price to pay for the advantages of a technologically advanced society.

A fundamental tenet of a democratic polity is participation in policy decisions by the citizenry. The complexity of the issues facing the United States, the dead weight and impersonality of various bureaucracies, the felt impotence of individual action, leave many with a sense of alienation and frustration. The quality of living is of concern to every individual; it is a matter of daily existence, of physical and mental well-being. Technical expertise is frequently posited as an argument against citizen participation in decision-making. Yet, there are those who argue that both the citizen's responsibility and his right to choose among policy alternatives are not contingent upon expert knowledge. The information experts provide does not in itself determine which of possible alternatives are inherently good; the good life is a matter of values that transcend technical matters.

Confronted with the wide ranging controversies over environmental problems, it becomes the responsibility of all to familiarize themselves with the problems and their ramifications. The citizen can act more in accordance with his particular set of principles and his particular philosophic belief when, armed with knowledge of the underlying issues imbedded in what often appear to be technical matters, the available alternatives become clarified.

The quality of living invariably encompasses the totality of man's existence. The social, political and economic institutions he has created define the quality of living as much as his relationship to the physical environment. The selections contained herein deal with only one aspect of the quality of living; the very consequences of man's technological and scientific advance, some of which are rooted in the long forgotten past, others of which are of recent origin. Even then there are entire realms of legitimate inquiry that have not been pursued.

The readings that follow are designed to provide the reader with an introduction to the multi-faceted controversies that revolve around ecological problems. A well-informed public is better able to critically evaluate the mass of material that deluges us daily, better able to make judgments and take appropriate action.

2

Man and His Environment

(Act Nature-Ally)

All things are implicated with one another, and the bond is holy; and there is hardly anything unconnected with any other thing. For things have been coordinated, and they combine to form the same universe. For there is one universe made up of all things, and one god who pervades all things, and one substance, and one law, common reason in all intelligent animals, and one truth; and if indeed there is also one perfection for all animals which are of the same stock and participate in the same reason.

-From MEDITATIONS by Marcus Aurelius (ca. 170 A.D.)

Nature and Pre-Industrial Man

By JEAN DORST

Man's impact on biological balances dates from his appearance on earth. If it is possible to regard man at that distant time as a natural element like any other animal, it was a purely temporary condition. The history of humanity may be envisaged partly as the struggle of our species against its environment, involving a progressive liberation from certain natural laws, and the gradual enslavement of the world, its soil, plants and animals by man's inventions. For a long time man's influence was negligible because populations were small and technical equipment modest. This situation prevailed until modern times in certain parts of the world. If we examine all past civilizations, it is apparent that some attained very great perfection intellectually while lagging behind technically. Hence their impact on nature was, on the whole, relatively slight.

This does not mean that ancient man did not exert a dominant influence on his environment, an influence often prejudicial to his own interests. Unlike most other animal species, man is capable of destroying his habitat long before feeling the effects of this wantonness. When a herbivore multiplies beyond the capacity of its habitat and starts to destroy it, populations decrease rapidly and pressure on the habitat immediately drops. When a predator multiplies to such a point that its prey is exterminated or considerably reduced, predator populations diminish. Man knows no short-term limiting factors because of his intelligence, his resistance to unfavourable environmental conditions and his ecological flexibility. The natural biological balance between man and nature disappeared as soon as the hunter became a shepherd, and certainly by the time he began to farm. Problems of conservation have existed since the dawn of human history. Some parts of the world which formed the cradle of ancient cultures were ruined long before 'modern' civilization penetrated them. . . .

At first man lived on fruits, plants and animals that were easy to capture. Then he invented various types of weapons which enabled him to hunt and fish. At this stage, reached in the lower Paleolithic Age, man was completely dependent on his natural environment. The fluctuations of this environment, affecting the quantity of food available, obliged him to adapt himself or to seek his requirements elsewhere. Although these men felled trees to feed their fires and make clearings for camps, the habitats were scarcely modified. Furthermore, depredations were limited, for there was an auto-regulation of predator-prey relationships similar to the one found throughout the animal kingdom.

More advanced tribes of hunters have, however, exerted a much greater influence on the natural balance of their environment because they set fires to help them capture frightened herds. Some prehistorians think that man played a part in causing the disappearance of some of the larger and more gregarious mammals, especially the cave bear (*Ursus spelaeus*). Brush fires have been—and still are—lit in Africa to the detriment of plant associations. Thus primitive man already possessed a weapon of sufficient power to modify natural habitats, opening the way to accelerated erosion and devastation

This influence becomes even more apparent among tribes which have developed techniques for a kind of wild pastoralism. The best example is that of the North American Indians, who were responsible for extending prairies across the great plains in the centre of the North American continent. Their favourite prey was the bison, on which they depended for food and clothing and to which they were mystically attached. . . .

On the whole, hunting tribes have caused very little change on the face of the globe. Spread over large areas, they are still an integral part of their surroundings. In primitive societies the method of preserving meat by smoking and salting was unsatisfactory as a basis for trade, but the development of more advanced techniques threatened the natural balance.

In the next stage man gradually became shepherds. In the Near East herbivores were domesticated 7000 or 8000 years ago, thus permitting man to draw a profit from the otherwise unproductive green cover. . . .

The impact of shepherds on their habitats was far more extensive than that of the hunters. It consisted essentially in a regression of closed habitats (forests) and an increase of open ones (savannas, steppes). The usual procedure was to burn trees, bushes and, in general, all living species, which were then replaced by annual herbaceous plants. The use of fire—which was pre-industrial man's best weapon for transforming habitats—is still practised by shepherds in tropical Africa. But farmers also set fires after a hasty clearing of the fields; so the two worked together to destroy the forest and replace it by open habitats. The landscape was thus completely transformed, erosion accelerated, and rivers and even the climate affected.

Transformation of habitats is made worse since man often tends to increase the number of domestic animals, causing overgrazing

6 MAKE UP YOUR OWN MIND III

with disastrous consequences to the balance of both the soil and the biological communities. This occurs frequently because, among many pastoral societies such as the Masai of East Africa, cattle are not only a source of food but a symbol of wealth and power. We should also emphasize the mystic links that have existed since time immemorial between shepherds and their flocks. These are extremely important. The classical example is in India, where, especially in the Indo-Ganges plains, cows are held sacred. This religious tradition goes back to ancient times when vanished tribes of shepherds made it a law. . . . The effect of such beliefs on overgrazing speaks for itself.

Shepherds were largely responsible for destroying vast areas of the world, especially in the Mediterranean region and the Near East, long before industrial civilization began its ravages. Although numerous wars forced abandonment of conservation practices and intelligent land management, it was the shepherd who played the dominant role in the degradation of the Mediterranean world. Here many deserts are man-made, since the vegetation does not correspond to either the environment or the climate. . . . The magnificent effort which the Israelis are now making to restore the soil proves that the land of Canaan 'flowing with milk and honey' is not a totally lost paradise.

—From BEFORE NATURE DIES by Jean Dorst. © 1970. Houghton Mifflin Co. Reprinted by permission.

The Worship of Nature

By ARNOLD TOYNBEE

Man begins by worshipping Nature; when he ceases to worship Nature, he is left with a spiritual vacuum which he is impelled to fill; and he is then confronted with the choice of substituting for the worship of Nature either a worship of himself or an approach to Absolute Reality through the worship of God or quest for Brahma or for Nirvana. This religious issue was raised by the recent rise of the civilizations, and it has not yet been decided. In a twentieth-century world in which the whole living generation of Mankind is being knit together into a single society within a frame work built by Western technology, this is the fundamental issue underlying all current economic, political, and ideological controversies. Shall Man worship Man or shall he worship God and seek Brahma-Nirvana?

Of these three religions or spiritual paths that have been in competition for Man's allegiance during the Age of the Civilizations, the worship of Nature is by far the oldest and the most deeply rooted. What Man's original religion may have been is a question that was still under debate in A.D. 1956. . . . It is, indeed, conceivable that Man did not begin to worship Nature until he had begun to be able to manipulate her for his own purposes; for it would perhaps be

difficult to worship a power which one has no hope of being able to influence. The worship of Nature will have had its floruit in the long age during which Man felt himself to be neither wholly impotent in the face of Nature (so that it was now no longer quite useless for him to try to influence her) nor wholly master of her (so that to try to influence her was still worth his while). This period, which will have begun when Man began to pass out of a purely passive food-gathering stage of winning his livelihood into a comparatively active hunting and fishing stage, must have lasted for hundreds of thousands of years. This is a long spell of time by comparison with the 3,000 years or thereabouts during which Man—having reached a stage in his history at which he is no longer willing to worship Nature because he fancies that he has subjugated her—has been torn between Man himself and God as the object of his worship (or between human power or happiness and Brahma-Nirvana as his spiritual objective).

Man did achieve the subjugation of Non-Human Nature in the Upper Palaeolithic Age a few tens of thousand of years ago—at a date, that is to say, which is very recent on the Time-scale of the age of the Human Race, but is a considerable time ago on the Time-scale of the age of the civilizations. Since that date there has been no possibility of any other creature's challenging Man's supremacy on Earth, and no possibility of Man's losing his battle with Inanimate Nature so long as the climate of the Earth's surface remains within the range within which it has oscillated since this planet first gave harbour to Life. Before the close of the Upper Palaeolithic Age, all Man's subsequent technological triumphs that have been achieved within these last few tens of thousands of years—down to the discovery of the techniques for combating or fostering disease-germs and for splitting the atom—were already virtually assured. They could have been predicted, no doubt, at any stage, by a twentieth-century man of science if he could have been carried back into the past by some Wellsian 'time-machine'.

The elements of Nature-worship embedded in living higher religions are something more than the fossilized remains of a dead primitive religion; they are indications that, below the surface of the Psyche, the worship of Nature is still alive. It is alive because the Non-Human Nature over which Man won his decisive victory in the Upper Palaeolithic Age is only one half—and this the less formidable half—of the Nature with which Man is confronted. The other half of Nature, with which Man still has to cope, is Nature as he finds her within himself.

Non-Human Nature can be subjugated by Man by main force. . . . On the whole, she has yielded to Man like a docile sheep, whereas Human Nature has shown itself as refractory, and as recalcitrant to human control, as a goat or a camel or a mule. When Man tries to coerce Human Nature, he defeats his own purpose; for, so far from cowing it, coercion merely stimulates its obstinacy, rebelliousness, and animosity. . . . this Nature that is Man's inseparable and intractable companion is expressively portrayed as a bull. This creature, far stronger physically than Man, which Man has precariously subjugated by the exercise of his Intellect and his

8 MAKE UP YOUR OWN MIND III

Will, is an apt symbol for those subconscious principalities and powers in the Psyche which are so much more difficult for the Intellect and the Will to cope with than any veritably non-human living creature is.

The abiding untamed power of the great subconscious abyss of Human Nature has been underestimated by Man in Process of Civilization since the discovery of the Intellect and the Will by the philosophers, though the philosophers have not gone to the same lengths of *hybris* in all societies. . . .

When the Intellect and the Will ignore the subconscious abyss of the Psyche, they do so at their peril; for, so far from being the whole of Human Nature, they are merely a spirit moving upon the face of the waters—a feeble light cast by a wick that draws its faint luminosity from the opaque oil in the bowl of the lamp on whose surface the wick is floating. The light shineth in the darkness, and the darkness comprehendeth it not.

At a time when this question of the relation between the Will and Intellect and the Subconscious Psyche was much on the writer's mind, he found himself in Southern California among the green lawns of Los Angeles. The city is so extensive when measured by the standard of mobility even of the driver of an automobile that the pedestrian visitor is prone to forget that, on the map of the continent as seen by a traveller in an aeroplane, this garden-city which, on the ground, seems boundless, is merely a tiny patch of verdure marooned in the midst of a vast desert. Moreover, the green is so perpetual that the spectator is also prone to forget that it is kept in existence only by a . . . perpetual *tour de force*. Though on every lawn he sees the sprinklers twisting and turning all day long, he soon comes to take the lawns for granted, as if they had been natural products of a non-existent rainfall. So it gives him a shock when on some vacant lot—kept vacant, perhaps, by a speculator in the hope of rising prices—he sees the savage desert sage-brush bristling up out of a parched and dusty ground. He then realizes that, under the artificial green lawns, the same savage Nature that has here broken its way to the surface is all the time eagerly waiting for an opportunity thus to come into its own again. This is the precarious position of the Intellect and Will. At any moment they may be impaled on the bristles of the sprouting sage-brush, be tossed on the horns of the goring bull, or be blown up from the crater of the erupting volcano.

In spite of his pride of Intellect and Will, Man has, for his self-preservation, to find some way of coping with a Nature that, in the Human Psyche, is still untamed and that, in this psychic field, cannot be tamed by force. Man has met this need by unavowedly retaining the worship of Nature in an age in which his official object of worship is either himself or God. The relics of a once official Nature-worship that are visibly embedded in the living religions are only a small fraction of the Nature-worship that still survives. . . .

. . . The Intellect and Will may have gained a decisive victory over External Physical Nature perhaps as long as 30,000 years ago; and, perhaps as long as 3,000 years ago, they may have staked out a claim to be the only elements in Human Nature that are of any

account. Yet they are only just beginning, in our day, to discover, explore, and so perhaps master, step by step, the actually still untamed Inner Psychic Nature of Man himself.

—From *AN HISTORIAN'S APPROACH TO RELIGION* by Arnold Toynbee. © 1956, Oxford University Press. Reprinted by permission.

Man's Mission—Subdue the Earth

By JOHN QUINCY ADAMS

If the Clerk will be so good as to read the 26th, 27th, and 28th verses of the 1st chapter of Genesis, the committee will see what I consider to be the foundation of the title of the United States. (to Oregon)

The Clerk read accordingly as follows:

"26. And God said, Let us make man in our image, after our likeness; and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth.

"27. So God created man in his own image, in the image of God created he him: male and female created he them.

"28. And God blessed them, and God said unto them. Be fruitful and multiply, and replenish the earth, and subdue it; and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth."

That, sir, (continued Mr. A.) in my judgment, is the foundation not only of our title to the territory of Oregon, but the foundation of all human title to all human possessions. . . . it is in this book that the title to jurisdiction, to eminent domain, to individual property, had its foundation—

Now, that general authority given to man to increase, multiply, and replenish the earth, and subdue it, was a grant from the Creator to man as man; it was a grant to every individual of the human race in his individual capacity. But, then, the portion that belongs to the individual, and was given thereby, was a matter for the whole human race to accommodate among themselves. That is to say, in communities, communities were to agree together what should be the metes and bounds of that portion of the earth given them by the general grant from the Creator.

—From a speech to Congress regarding the U. S. claim to Oregon, February 9, 1846.

The Natural Life

Hurray for those who never invented anything
Hurray for those who never explored anything
Hurray for those who never conquered anything
But who, in awe, give themselves up to the essence of things

10 MAKE UP YOUR OWN MIND III

Ignorant of the shell, but seized by the rhythm of things
Not intent on conquest, but playing the play of the world.

-From the poetry of AIME CESAIRE

O our Mother the Earth, O our Father the Sky,
Your children are we, and with tired backs
We bring you the gifts you love,
Then weave for us a garment of brightness;
May the warp be the white light of morning,
May the weft be the red light of evening,
May the fringes be the falling rain,
May the border be the standing rainbow.
Thus weave for us a garment of brightness,
That we may walk fittingly where birds sing,
That we may walk fittingly where grass is green,
O our Mother the Earth, O our Father the Sky.

-From SONGS OF THE TEWA by Herbert Spinden, 1933. (The Tewa are Pueblo Indians from New Mexico and Arizona.)

As a child I understood how to give; I have forgotten this grace since I became civilized. I lived the natural life, whereas I now live the artificial. Any pretty pebble was valuable to me then; every growing tree an object of reverence. Now I worship with the white man before a painted landscape whose value is estimated in dollars! Thus the Indian is reconstructed, as the natural rocks are ground to powder and made into artificial blocks which may be built into the walls of modern society.

-From THE SOUL OF THE INDIAN by Charles A. Eastman (Ohiyesah), 1911.

Man's War With Nature

By ERIC HOFFER

. . . Man became what he is, not with the aid of, but in spite of nature. Humanization meant breaking away from nature, getting out from underneath the iron necessities which dominate nature. By the same token, dehumanization means the reclamation of man by nature. It means the return of nature. It is significant that humanization had its start in the fact that man was an unfinished, defective animal. Nature dealt niggardly with him from the beginning. It brought him forth naked and helpless, without inborn skills and without specialized organs to serve him as weapons and tools. Unlike other animals, man was not a born technician with a built-in tool kit. Small wonder that for millennia man worshipped animals, nature's more favored children. Yet this misbegotten creature has

made himself lord of the globe. He has evolved fabulous substitutes for the instincts and the specialized organs that he lacked, and rather than adjust himself to the world he has changed the world to fit him. This, surely, is the supreme miracle. If history is to have meaning it must be the history of humanization, of man's tortuous ascent through the ages, of his ceaseless effort to break away from the rest of creation and become an order apart.

The contest with nature has the refined trickery we have come to associate with totalitarian wars. There are fifth columns, subversion, and a constant probing for soft spots. Just as man uses the forces of nature to subdue nature, so does nature use men to dehumanize their fellow men; and it is in the city that nature's fifth column finds its most fertile ground. The birth of the city was a crucial step in man's separation from nature. The city cut man off not only from the nonhuman cosmos but also from clans, tribes, and other primitive modes of organization. A self-governing city populated by more or less autonomous individuals has been the cradle of freedom, art, literature, science, and technology. But the city that has been a citadel against the nature around us cannot defend us against the nature within us—in our lusts and fears, and in the subconscious cellars of our minds. It is in the city that man's lusts and fears have free play, and that dehumanization spreads like the plague. The lust for power in particular has shown itself to be antihuman. We savor power not when we move mountains and tell rivers whither to flow but when we can turn men into objects, robots, puppets, automata, or veritable animals. Power is power to dehumanize, and it is in the city that this lust finds the human material to work on . . .

There is hardly an enormity committed in the twentieth century that has not been foreshadowed and even advocated by some noble "man of words" in the nineteenth. Even such clear-cut opposites as the fascination with science and the romantic back-to-nature movements were actually pulling in the same direction—helping to equate man with nature, and cooperating in the dehumanization of man. They who leaped ahead and they who plunged backward arrived simultaneously at the gates of the twentieth century annihilation camps.

One of the strangest features of man's war with nature is its undeclaredness. The men who are in the forefront of the battle are as a rule unaware that they are fighting a war. They are usually animated by a hunger for profit or for spectacular action. I have not come across a clarion call to mankind to abandon war between brothers and mobilize all its energies in a titanic struggle with the non-human universe. You can count on the fingers of one hand unequivocal expressions of the eternal enmity between man and nature. I can think only of Hardy's "Man begins where nature ends; nature and man can never be friends." Thoreau, who sided with nature, recognized that "you cannot have a deep sympathy with both man and nature" and admitted, "I love nature because she is not man but a retreat from him."

The first great assault upon nature took place in the Neolithic Age when there was as yet no writing; thus it remained

12 MAKE UP YOUR OWN MIND III

unrecorded and unsung. Yet it is legitimate to wonder whether the presence of scribes would have mattered one way or another—whether the “men of words” would have been aware of the import of that which was happening before their eyes, let alone moved enough to declaim and sing. For when the second great assault came in the nineteenth century and the “men of words” were not in the fight and, indeed, a great many of them sided with nature against man. It was precisely at the moment when the industrial revolution forged the weapons for a total victory over nature that scientists, poets, philosophers, and historians, seized with a mysterious impulse, began to proclaim with one voice the littleness of man and his powerlessness to shape his fate. Man, declared Huxley in 1960, “strives in vain to break through the ties which hold him to matter and the lower forms of life.” Instead of being in the vanguard of the Promethean struggle we find the most gifted members of the species on the sidelines jeering at the clamorous multitude that set out to tame and straddle God’s creation . . .

Some thoughtful persons have questioned the wisdom of seeking further command over nature until means have been devised to prevent the misuse of the enormous power we already have in our hands. Nevertheless, the overcoming of nature, so crucial in the ascent of man, can be a most effective agency of humanization in the decades ahead—if for no other reason than that it may divert aggressive impulses and wild energies from social strife.

My feeling is that the humanization of billions of adolescents would be greatly facilitated by a concerted undertaking to master and domesticate the whole of the globe. One would like to see mankind spend the balance of the century in a total effort to clean up and groom the surface of the globe—wipe out the jungles, turn deserts and swamps into arable land, terrace barren mountains, regulate rivers, eradicate all pests, control the weather, and make the whole land mass a fit habitation for man. A hundred years ago Alfred Russel Wallace envisioned the time “when the earth will produce only civilized plants and domestic animals; when man’s selection shall have supplanted natural selection; and when the ocean would be the only domain in which that power can be exerted which for countless cycles of ages ruled supreme over all the earth.” So, too, did the prophet Isaiah envision total domestication at the end of time when the wolf and the lamb, the leopard and the kid, the lion and the calf, the bear and the cow shall lie down together, and a little child shall lead them.

—From THE TEMPER OF OUR TIME © 1966 by Eric Hoffer. Reprinted by permission of Harper and Row, Publishers.

A Bill of Rights For All Living Things

By JEAN MAYER

As regards Nature, or as it is now called “the Environment,” when I listen to laymen and to my biologist colleagues, I hear two

entirely different themes. In the United States at least, the preponderant message harps on the threat to the health and to the continued existence of *Man*. The relatedness of every living creature to every other living creature is emphasized mainly to remind the audience that if some species have been exterminated or are being exterminated, this indicates that Man is threatened—either directly by the same agents which will sooner or later overcome a higher human threshold of toxicity—or indirectly through a long chain of intermediary disturbances in the food chain or in the mutual predation of pathogenic species; the ambiguity created by the abominable modern practice of eliminating prepositions in the designation of Government agencies lends itself to the interpretation that, in this new, Environmental Protection simply means protection of Man from the Environment—rather than protection of the Environment from Man. . . . the value of animals and of the need for their survival for their own sake because they, too, are creatures of Nature—of God if you please—endowed with motion, with sensitivity, with courage, with the instinct to live and to procreate, our relatives and friends embarked with us on a long cruise in the middle of an empty frozen waste punctuated with radioactive fires. Every now and then we observe episodic concern. We worry about the survival of the whales, those magnificent mammals with those strange and melancholy voices tenderly nurturing their young in the difficult stretches of the Arctic seas. We are indignant at baby seals being clubbed to death or at the last snow leopards being hunted down and shot so that thoughtless pampered girls living in prosperous overheated towns can sport the inanimate skins as conspicuous displays of unearned wealth. We deplore the massive numbers of marine birds being asphyxiated and drowned by the sudden spread on the familiar sea of a lethal flood of petroleum released by the malfunction of the tools of a voracious and careless civilization. And we sometimes try to stop the last, straggling, hungry foxes in the suburban landscape from being killed after an exhausting chase by dozens of baying hounds and pink-liveried worshippers of an uncaring past. These outbreaks of indignation seldom seem to coalesce into a coherent ethos of protection of Nature qua Nature, of the rights of animals or at least of species to survival, to sufficient space to feed and breed unhampered, and to freedom from new threats from an encroaching technology. We always fall short of agreeing on a Bill of Rights for animals—an equivalent of "life, liberty and the pursuit of happiness," if not for individual animals, at least for enough representatives of each species, or for the species itself.

The fact is that the traditional Judeo-Christian philosophy which so completely permeates Western thinking—its traditional religion, its Marxist heresies and its ethical agnosticism—give us essentially no guidance for the treatment of animals and the conservation of Nature. After Genesis I—the appearance of the "moving creatures in water, . . . the great whales, . . . the winged fowl, . . . beasts and cattle," with the solitary exception of the story of Noah's Ark, animals come into the Old or the New Testament only as sources of food, leather or wool, or as symbols for Man as in the story of the lost sheep. Even though the Middle East is hardly the most lux-

14 MAKE UP YOUR OWN MIND III

uriant natural area, even though so many of the more important episodes of both the Old and the New Testament take place in barren areas, the Naturalist shivers at the absence of Nature in so much of the text. It is indeed "the voice of He who cries in the desert."

Societies other than the Western—such as the animist cultures and those hundreds of millions of Asians who believe in the transmigration of souls—have a better basis for an ethic of conservation of our living planet. Unfortunately, on an individual basis, a belief in the transmigration of souls, while it forbids the act of killing, does not always translate itself into a humane attitude towards the living animals. More important, it has not yet been translated into a general, large scale philosophy of conservation, in a century where the killing of animals and the disappearance of species usually takes place through indirect means. Beliefs in soul transmigration and animism are in full retreat before the spread of science and technology; whether the ethical message will survive the theology is by no means assured.

In the United States, after the brief honeymoon of the first Thanksgiving, the intolerance and the greed of the white settlers led to warfare with the original Indian inhabitants and then to genocide. This human disaster prevented the newcomers from absorbing from the native Americans their philosophy of oneness with Nature and accountability for the taking of animal life. From contaminating Indians with infected blankets in Massachusetts to the extermination of the buffalo, the attitude of white Americans has been that anything which caused immediate problems for the Westward movement should be eliminated. Like our economic system, the Westward movement followed its inner logic without consideration of long run or "natural" concerns. Hacking out of nature an environment for Man gave way to the establishment of an environment for the White Man, then for Industrial Man, with Nature and the Animal Kingdom given essentially no consideration.

... speaking to a group of biologists, I want to advocate one ... thesis. We must extend to the whole of the Biotic world the Kantian precept that persons must be treated not as means but as ends unto themselves. This extended Kantian principle is particularly valid when applied to whole species. We must teach ourselves and others that dominion over the beasts and the plants of the earth entails accountability. We can do it better than anybody else because as biologists we have learned the profound unit of life—the sharing of common protoplasmic mechanisms, common cellular structure and, with various degrees of closeness depending on the closeness of our evolutionary kinship, common organ functions, common regulatory patterns and a common integrative role for our nervous system. We must stop feeling that we always need to justify conservation through possible usefulness to Man. We will obviously tend to favor Man, but we must teach our children to feel kinship for all the natural world. Anyone who has seen a osprey perching on the rocks overlooking a winter beach and a grey chopping sea can be taught to feel the intrinsic worth of this splendid animal battling for its survival and that of its species in a difficult

world—and to feel anxiety and pride in the survival of this great fellow creature. Given a chance to observe it, many will grieve the progressive disappearance of urchins, sea anemones and starfish from a polluted coast—and not just on the basis of what the death of their larvae means in terms of threat to our food chain. We must learn again to love Nature for its own sake and we must teach this knowledge to others. And while we must become better at translating the Gospel into daily acts of love toward all our human neighbors, we have a special duty as biologists to remember Genesis:

"And the bow shall be in the cloud; and I will look upon it, that I may remember the everlasting covenant between God and every living creature of every flesh that is upon the earth."

—From the 1970 W. O. Atwater Memorial Lecture, 2nd National Biological Congress, October 24, 1971.

Unity of Man and Nature

By SIR RABINDRANATH TAGORE

We stand before this great world. The truth of our life depends upon our attitude of mind towards it—an attitude which is formed by our habit of dealing with it according to the special circumstance of our surroundings and our temperaments. It guides our attempts to establish relations with the universe either by conquest or by union, either through the cultivation of power or through that of sympathy. And thus, in our realisation of the truth of existence, we put our emphasis either upon the principle of dualism or upon the principle of unity.

The meaning of this is, that, when we know the multiplicity of things as the final truth, we try to augment ourselves by the external possession of them; but, when we know the Infinite Soul as the final truth, then through our union with it we realise the joy of our soul.

This ideal of perfection preached by the forest-dwellers of ancient India runs through the heart of our classical literature and still dominates our mind. The legends related in our epics cluster under the forest shade bearing all through their narrative the message of the forest-dwellers.

The history of the Northmen of Europe is resonant with the music of the sea. That sea is not merely topographical in its significance, but represents certain ideals of life which still guide the history and inspire the creations of that race. In the sea, nature presented herself to those men in her aspect of a danger, a barrier which seemed to be at constant war with the land and its children. The sea was the challenge of untamed nature to the indomitable human soul. And man did not flinch; he fought and won, and the spirit of fight continued in him. This fight he still maintains; it is the fight against disease and poverty, tyranny of matter and of man.

16 MAKE UP YOUR OWN MIND III

This refers to a people who live by the sea, and ride on it as on a wild, champing horse, catching it by its mane and making it render service from shore to shore. They find delight in turning by force the antagonism of circumstances into obedience. Truth appears to them in her aspect of dualism, the perpetual conflict of good and evil, which has no reconciliation, which can only end in victory or defeat.

But in the level tracts of Northern India men found no barrier between their lives and the grand life that permeates the universe. The forest entered into a close living relationship with their work and leisure, with their daily necessities and contemplations. They could not think of other surroundings as separate or inimical. So the view of the truth, which these men found, did not make manifest the difference, but rather the unity of all things. They uttered their faith in these words: "Yadidam kinch sarvam prāna ējati nih-sratam" (All that is vibrates with life, having come out from life). When we know this world as alien to us, then its mechanical aspect takes prominence in our mind; and then we set up our machines and our methods to deal with it and make as much profit as our knowledge of its mechanism allows us to do. This view of things does not play us false, for the machine has its place in this world. And not only this material universe, but human beings also, may be used as machines and made to yield powerful results. This aspect of truth cannot be ignored; it has to be known and mastered. Europe has done so and has reaped a rich harvest.

According to the true Indian view, our consciousness of the world, merely as the sum total of things that exist, and as governed by laws, is imperfect. But it is perfect when our consciousness realises all things as spiritually one with it, and therefore capable of giving us joy. For us the highest purpose of this world is not merely living in it, knowing it and making use of it, but realising our own selves in it through expansion of sympathy; not alienating ourselves from it and dominating it, but comprehending and uniting it with ourselves in perfect union.

India holds sacred, and counts as places of pilgrimage, all spots which display a special beauty or splendour of nature. These had no original attraction on account of any special fitness for cultivation or settlement. Here, man is free, not to look upon Nature as a source of supply of his necessities, but to realise his soul beyond himself. The Himālayas of India are sacred and the Vindhya Hills. Her majestic rivers are sacred. Lake Mānasa and the confluence of the Ganges and the Jamuna are sacred. India has saturated with her love and worship the great Nature with which her children are surrounded, whose light fills their eyes with gladness, and whose water cleanses them, whose food gives them life, and from whose majestic mystery comes forth the constant revelation of the infinite in music, scent, and colour, which brings its awakening to the soul of man. India gains the world through worship, through spiritual communion; and the idea of freedom to which she aspired was based upon the realisation of her spiritual unity.

-From CREATIVE UNITY, 1922.

The Goals of Man

By HENRY DAVID THOREAU

The mass of men lead lives of quiet desperation. What is called resignation is confirmed desperation. From the desperate city you go into the desperate country, and have to console yourself with the bravery of minks and muskrats. A stereotyped but unconscious despair is concealed even under what are called the games and amusements of mankind. There is no play in them, for this comes after work. But it is a characteristic of wisdom not to do desperate things.

When we consider what, to use the words of the catechism, is the chief end of man, and what are the true necessities and means of life, it appears as if men had deliberately chosen the common mode of living because they preferred it to any other. Yet they honestly think there is no choice left. But alert and healthy natures remember that the sun rose clear. It is never too late to give up our prejudices. No way of thinking or doing, however ancient, can be trusted without proof. What everybody echoes or in silence passes by as true to-day may turn out to be falsehood to-morrow, mere smoke of opinion, which some had trusted for a cloud that would sprinkle fertilizing rain on their fields. What old people say you cannot do, you try and find that you can. Old deeds for old people, and new deeds for new. . . .

. . . But man's capacities have never been measured; nor are we to judge of what he can do by any precedents, so little has been tried. Whatever have been thy failures hitherto, "be not afflicted, my child, for who shall assign to thee what thou hast left undone?"

We might try our lives by a thousand simple tests; as, for instance, that the same sun which ripens my beans illumines at once a system of earths like ours. If I had remembered this it would have prevented some mistakes. This was not the light in which I hoed them. The stars are the apexes of what wonderful triangles! What distant and different beings in the various mansions of the universe are contemplating the same one at the same moment! Nature and human life are as various as our several constitutions. Who shall say what prospect life offers to another? Could a greater miracle take place than for us to look through each other's eyes for an instant? . . .

I think that we may safely trust a good deal more than we do. We may waive just so much care of ourselves as we honestly bestow elsewhere. Nature is as well adapted to our weakness as to our strength. The incessant anxiety and strain of some is a well nigh incurable form of disease. We are made to exaggerate the importance of what work we do; and yet how much is not done by us! or, what if we had been taken sick? How vigilant we are! determined not to live by faith if we can avoid it; all the day long on the alert, at night we unwillingly say our prayers and commit ourselves to uncertainties. . . .

Most of the luxuries, and many of the so called comforts of life, are not only not indispensable, but positive hinderances to the

18 MAKE UP YOUR OWN MIND III

elevation of mankind. With respect to luxuries and comforts, the wisest have ever lived a more simple and meager life than the poor. The ancient philosophers, Chinese, Hindoo, Persian, and Greek, were a class than which none has been poorer in outward riches, none so rich in inward. . . .

When a man is warmed by the several modes . . . what does he want next? Surely not more warmth of the same kind, as more and richer food, larger and more splendid houses, finer and more abundant clothing, more numerous incessant and hotter fires, and the like. When he has obtained those things which are necessary to life, there is another alternative than to obtain the superfluities; and that is, to adventure on life now, his vacation from humbler toil having commenced. The soil, it appears, is suited to the seed, for it has sent its radicle downward, and it may now send its shoot upward also with confidence. Why has man rooted himself thus firmly in the earth, but that he may rise in the same proportion into the heavens above? . . .

I do not mean to prescribe rules to strong and valiant natures, who will mind their own affairs whether in heaven or hell, and perchance build more magnificently and spend more lavishly than the richest, without ever impoverishing themselves, not knowing how they live, . . . but mainly to the mass of men who are discontented, and idly complaining of the hardness of their lot or of the times, when they might improve them. There are some who complain most energetically and inconsolably of any, because they are, as they say, doing their duty. I also have in my mind that seemingly wealthy, but most terribly impoverished class of all, who have accumulated dross, but know not how to use it, or get rid of it, and thus have forged their own golden or silver fetters.

If I should attempt to tell how I have desired to spend my life in years past, it would probably surprise those of my readers who are somewhat acquainted with its actual history. . . .

-From WALDEN, 1854.

3

Population, Resources and the Good Life

(People! Who Needs 'Em?)

THE MISERY OF MANKIND

By ROBERT MALTHUS

I think I may fairly make two postulata.

First, That food is necessary to the existence of man.

Secondly, That the passion between the sexes is necessary, and will remain nearly in its present state.

These two laws ever since we have had any knowledge of mankind, appear to have been fixed laws of our nature; and, as we have not hitherto seen any alteration in them, we have no right to conclude that they will ever cease to be what they now are, without an immediate act of power in that Being who first arranged the system of the universe; and for the advantage of His creatures, still executes, according to fixed laws, all its various operations.

I do not know that any writer has supposed that on this earth man will ultimately be able to live without food

. . . the best arguments for the perfectibility of man, are drawn from a contemplation of the great progress that he has already made from the savage state, and the difficulty of saying where he is to stop. But towards the extinction of the passion between the sexes, no progress whatever has hitherto been made. It appears to exist in as much force at present as it did two thousand, or four thousand years ago. There are individual exceptions now as there always have been. But, as these exceptions do not appear to increase in number, it would surely be a very unphilosophical mode of arguing, to infer merely from the existence of an exception, that the exception would, in time, become the rule, and the rule the exception.

Assuming then, my postulata as granted, I say, that the power of population is indefinitely greater than the power in the earth to produce subsistence for man.

Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio. A slight acquaintance with numbers will shew the immensity of the first power in comparison of the second.

By that law of our nature which makes food necessary to the life of man, the effects of these two unequal powers must be kept equal.

This implies a strong and constantly operating check on population from the difficulty of subsistence. This difficulty must fall some where; and must necessarily be severely felt by a large portion of mankind.

Through the animal and vegetable kingdoms, nature has scattered the seeds of life abroad with the most profuse and liberal hand. She has been comparatively sparing in the room, and the nourishment necessary to rear them. The germs of existence contained in this spot of earth, with ample food, and ample room to expand in, would fill millions of worlds in the course of a few thousand years. Necessity, that imperious all pervading law of nature, restrains them within the prescribed bounds. The race of plants, and the race of animals shrink under this great restrictive law. And the race of man cannot, by any efforts of reason, escape from it. Among plants and animals its effects are waste of seed, sickness, and premature death. Among mankind, misery and vice. The former, misery, is an absolutely necessary consequence of it. Vice is a highly probable consequence, and we therefore see it abundantly prevail; but it ought not, perhaps, to be called an absolutely necessary consequence. The ordeal of virtue is to resist all temptation to evil.

This natural inequality of the two powers of population, and of production in the earth, and that great law of our nature which must constantly keep their effects equal, form the great difficulty that to me appears insurmountable in the way to the perfectibility of society. All other arguments are of slight and subordinate consideration in comparison of this. I see no way by which man can escape from the weight of this law which pervades all animated nature. No fancied equality, no agrarian regulations in their utmost extent, could remove the pressure of it even for a single century. And it appears, therefore, to be decisive against the possible existence of a society, all the members of which, should live in ease, happiness, and comparative leisure; and feel no anxiety about providing the means of subsistence for themselves and families.

Consequently, if the premises are just, the argument is conclusive against the perfectibility of the mass of mankind.

. . . let us take the whole earth. . . and suppose that the restraints to population were universally removed. If the subsistence for man that the earth affords was to be increased every twenty-five years by a quantity equal to what the whole world at present produces, this would allow the power of production in the earth to be absolutely unlimited, and its ratio of increase much greater than we can conceive that any possible exertions of mankind could make it.

Taking the population of the world at any number, a thousand millions, for instance, the human species would increase in the ratio of—1, 2, 4, 8, 16, 32, 64, 128, 256, 512, &c. and subsistence as—1, 2, 3, 4, 5, 6, 7, 8, 9, 10, &c. In two centuries and a quarter, the population would be to the means of subsistence as 512 to 10; in three centuries as 4096 to 13, and in two thousand years the difference would be almost incalculable, though the produce in that time would have increased to an immense extent.

No limits whatever are placed to the productions of the earth;

they may increase for ever and be greater than any assignable quantity; yet still the power of population being a power of a superior order, the increase of the human species can only be kept commensurate to the increase of the means of subsistence, by the constant operation of the strong law of necessity acting as a check upon the greater power.

That population cannot increase without the means of subsistence is a proposition so evident that it needs no illustration.

That population does invariably increase where there are the means of subsistence, the history of every people that have ever existed will abundantly prove.

And that the superior power of population cannot be checked without producing misery or vice, the ample portion of these too bitter ingredients in the cup of human life and the continuance of the physical causes that seem to have produced them bear too convincing a testimony.

—From AN ESSAY ON THE PRINCIPLE OF POPULATION, 1798.

The Hope for Mankind

By WILLIAM HAZLITT

I conceive there were two very capital errors in Mr. Malthus's first essay, . . .

The first of these was, that vice and misery are the only checks to population: secondly, that if population were for any time freed from these restraints, it would in that case go on increasing with a force and rapidity, . . . and which would bear down the feeble mounds that had before opposed its progress till the whole would end in one wide scene of universal uproar and confusion.

. . . if there is any one inference to be drawn from the general spirit and tenor of Mr. Malthus's reasoning: it is this, that we ought not to encourage population, nor be anxious about the increase of the means of subsistence, but ought rather to keep them back as much as possible, because every addition made to population by whatever means or in whatever circumstances, has a direct and unavoidable tendency to make it go on increasing with an accelerated force;

. . . Mr. Malthus by setting a certain degree of plenty against a certain degree of excessive population, has made it appear as if the two things were inseparably connected, . . .

. . . It therefore looks very much as if plenty were the immediate fore-runner of famine, as if by sowing the seeds of virtue and happiness you were ensuring a larger harvest of vice and misery, the evil engrafted on any good being always greater than the real benefit itself, and as if by advancing population and increasing the means of its support, you were only opening a new Iliad of woes, and giving larger scope to the baneful operation of this principle. So that it

22 MAKE UP YOUR OWN MIND III

is not the increase of good that we are to think of, but the introduction of evil that we are to guard against.

. . . I should just reverse the reasoning of Mr. Malthus, who taking the evil as at its greatest height when the world is supposed to be completely full and completely enlightened, thence argues downwards against all attempts at improvement as dangerous innovations; so I, finding that an improved cultivation and enlarged population are good things through the inferior gradations, am apt to think they would continue so, proceeding upwards to the topmost round of the ladder, as far as population is concerned, . . .

. . . The tendency to excessive population in any community does not depend upon the number of individuals in it, who have the power of abusing their liberty, or on the quantity of mischief they *might* do, but upon the moral character of the individuals composing it, upon the difference between the strength of moral restraint and the strength of physical appetite, or on the actual inconveniences to which they *will* submit for the sake of gratifying their passions. In short the tendency to excess does not depend on the point in the scale where the *limit* is drawn, but upon the tendency to overleap that limit; now this tendency or *impetus* is not increased by the distance which it has gone, like a stone rolling down a hill, or like a torrent of water accumulating, but is like a cart or wagon left on a declivity with a drag-chain fastened to one of the wheels, which is carried forward till the chain is pulled tight and then it stops of itself. . . .

It is true there is tendency in population to increase *faster* than the means of subsistence, but not to increase *faster and faster* or to get more and more ahead of it. It is in fact only a disproportionate superiority in certain motives over others, which subjects the community or certain classes of it to a great degree of want and hardship: and as far as their imprudence and folly will carry them, they will go, but they will not go farther. They will submit to be *pinched*, but not to be *starved*, unless this consequence may sometimes be supposed to follow from the partial and unnatural debasement of certain classes of the community, by driving them to despair and rendering them callous to suffering. But the general tendency in population to become excessive can only be increased by the increased relaxation of moral restraint, or by gradually weakening the motives of prudence, reason, &c. I cannot make this matter plainer.

. . . when it arrives at a certain point, that is, where the population begins to press on the means of subsistence, either from natural or artificial causes, or when it threatens to become an evil from excess, it naturally stops short of its own accord, the checks to it from vice, misery and moral restraint taken all together becoming stronger as the excess becomes greater. It therefore produces its own antidote and produces it in quantities exactly in proportion to its own extent. It is not therefore . . . like a stone hanging suspended over a precipice, which if it once loses its balance will be hurled furiously down, rolling and bounding from steep to steep with increased velocity till it reaches the bottom, but like a balance sus-

pendent by a check-weight, where you cannot increase the pressure on one side without increasing the resistance proportionably on the other. It may therefore at worst be left very safely to itself, instead of being considered as an evil against whose unforeseen ravages no precautions are sufficient.

-From A REPLY TO THE ESSAY ON POPULATION, 1807.

Population Growth and Human Welfare

By POPE JOHN XXIII

. . . More recently, the question often is raised how economic organization and the means of subsistence can be balanced with population increase, whether in the world as a whole or within the needy nations.

. . . God in His goodness and wisdom has, on the one hand, provided nature with almost inexhaustible productive capacity; and, on the other hand, has endowed man with such ingenuity that, by using suitable means, he can apply nature's resources to the needs and requirements of existence. Accordingly, that the question posed may be clearly resolved, a course of action is not indeed to be followed whereby, contrary to the moral law laid down by God, procreative function also is violated. Rather, man should, by the use of his skills and science of every kind, acquire an intimate knowledge of the forces of nature and control them ever more extensively. Moreover, the advances hitherto made in science and technology give almost limitless promise for the future in this matter.

When it comes to questions of this kind, we are not unaware that in certain locales and also in poorer countries, it is often argued that in such an economic and social order, difficulties arise because citizens, each year more numerous, are unable to acquire sufficient food or sustenance where they live, and peoples do not show amicable cooperation to the extent they should.

But whatever be the situation, we clearly affirm these problems should be posed and resolved in such a way that man does not have recourse to methods and means contrary to his dignity, which are proposed by those persons who think of man and his life solely in material terms.

We judge that this question can be resolved only if economic and social advances preserve and augment the genuine welfare of individual citizens and of human society as a whole. Indeed, in a matter of this kind, first place must be accorded everything that pertains to the dignity of man as such, or to the life of individual men, than which nothing can be more precious. Moreover, in this matter, international cooperation is necessary, so that, conformably with the welfare of all, information, capital, and men themselves may move about among the peoples in orderly fashion.

In this connection, we strongly affirm that human life is transmitted and propagated through the instrumentality of the family which

rests on marriage, one and indissoluble, and, so far as Christians are concerned, elevated to the dignity of a sacrament. Because the life of man is passed on to other men deliberately and knowingly, it therefore follows that this should be done in accord with the most sacred, permanent, inviolate prescriptions of God. Everyone without exception is bound to recognize and observe these laws. Wherefore, in this matter, no one is permitted to use methods and procedures which may indeed be permissible to check the life of plants and animals.

Indeed, all must regard the life of man as sacred, since from its inception, it requires the action of God the Creator. Those who depart from this plan of God not only offend His divine majesty and dishonor themselves and the human race, but they also weaken the inner fibre of the commonwealth.

When God, as we read in the book of Genesis, imparted human nature to our first parents, He assigned them two tasks, one of which complements the other. For He first directed: "Be fruitful and multiply," and then immediately added: "Fill the earth and subdue it."

The second of these tasks, far from anticipating a destruction of goods, rather assigns them to the service of human life.

Accordingly, with great sadness we note two conflicting trends: on the one hand, the scarcity of goods is vaguely described as such that the life of men reportedly is in danger of perishing from misery and hunger; on the other hand, the recent discoveries of science, technical advances, and economic productivity are transformed into means whereby the human race is led toward ruin and a horrible death.

Now the provident God has bestowed upon humanity sufficient goods wherewith to bear with dignity the burdens associated with procreation of children. But this task will be difficult or even impossible if men, straying from the right road and with a perverse outlook, use the means mentioned above in a manner contrary to human reason or to their social nature, and hence, contrary to the directives of God Himself.

-From Mater et Magister, 1961.

Population Control for Underdeveloped Countries

By ROBERT S. McNAMARA

One-third of mankind today lives in an environment of relative abundance.

But two-thirds of mankind—more than two billion individuals—remain entrapped in a cruel web of circumstances that severely limits their right to the necessities of life. They have not yet been able to achieve the transition to self-sustaining economic growth. They are caught in the grip of hunger and malnutrition; high illiteracy; inadequate education; shrinking opportunity; and corrosive poverty.

The gap between the rich and poor nations is no longer merely

a gap. It is a chasm. On one side are nations of the West that enjoy per capita incomes in the \$3,000 range. On the other are nations in Asia and Africa that struggle to survive on per capita incomes of less than \$100.

To put it simply: the greatest single obstacle to the economic and social advancement of the majority of the peoples in the underdeveloped world is rampant population growth.

It required sixteen hundred years to double the world population of 250 million, as it stood in the first century A.D. Today, the more than three billion on earth will double in 35 years time, and the world's population will then be increasing at the rate of an additional billion every eight years.

One half of humanity is hungering at this very moment. There is less food per person on the planet today than there was 30 years ago in the midst of a worldwide depression.

Thousands of human beings will die today—as they die every day—of that hunger. They will either simply starve to death, or they will die because their diet is so inadequate that it cannot protect them from some easily preventable disease.

And yet the thousands who die are perhaps the more fortunate ones. For millions of other children, suffering the same malnutrition, do not die. They live languidly on—stunted in their bodies, and crippled in their minds.

What is particularly tragic in all of this is that when such mentally deprived children reach adulthood, they are likely to repeat the whole depressing sequence in their own families.

But the population explosion's corrosive effects on the quality of life do not end with hunger. They range through the whole spectrum of human deprivation.

Each additional child brought into the world must not only be fed, but clothed, housed, medically cared for, and supported by at least minimal educational services. All of this requires new capital—new capital that cannot be invested in other desperately needed sectors of the economy.

If the number of children in the total population—as a result of high birth rates—is very large, a nation is under the compelling necessity to expend ever greater resources simply to keep its people from slipping beneath minimum subsistence levels. A treadmill economy tends to emerge in which the total national effort will exhaust itself in running faster and faster merely to stand still.

Not only are these youngsters unequipped for the jobs that might have been available, but the total number of meaningful jobs itself tends to decline in proportion to the population simply because the government has been unable to invest adequately in job-producing enterprises.

Now I have noted that this entire question of population planning is incredibly complex. There are, of course, certain precise and painful moral dilemmas. But quite apart from these, there is a vague and murky mythology that befogs the issue. Not only does this collection of myths obscure the essentials of the problem, but worse still, it builds barriers to constructive action.

There is, to begin with, the generalized assumption that somehow "more people means more wealth." As with all fallacies, there is a deceptive substratum of plausibility to the thesis. With the earlier rise of nationalism in the West—and the more recent emergence of newly independent countries in Asia and Africa—rapid population growth has often been regarded as a symbol of national vigor. It provided, so it was believed, the foundations of a more powerful military establishment; an economically advantageous internal market; a pool of cheap labor; and, in general, a prestigious political place in the sun.

But in the underdeveloped world, nearly every one of these assumptions is false. Because rapid population growth tends seriously to retard growth in per capita income, the developing nation soon discovers that its economic vigor is diminished rather than enhanced by the phenomenon of high fertility.

"Cheap labor" in such countries turns out not to be cheap at all. For sound economic growth requires technological improvements, and these in turn demand higher levels of training than the strained government resources can supply. . . . The "cheap" labor turns out to be excessively expensive labor.

Even the argument of expanding the population in order to provide a powerful military force is suspect—not merely because the expansion of one nation's forces will, in time, lead to a reactive expansion of its neighbors' forces, but also because modern defense forces require an increasing ratio of educated recruits rather than mere masses of illiterate troops.

As for political prestige, nations caught in the catastrophe of an uncontrolled population growth do not enhance their position in the family of nations. On the contrary, they find it slipping away. . .

Akin to the myth that "more people means more wealth" is the notion that countries with large tracts of uninhabited open land have no need to worry about birth rates, since there is ample room for expansion.

The argument is as shallow as it is misleading. For the patent fact is that mere open land does not, in and of itself, support a high rate of population growth. Such open land—if it is to become the home of large numbers of people—must be provided with a whole panoply of heavy government investments: investments in roads, housing, sanitation, agricultural and industrial development.

What is equally overlooked is that a rational restraint on fertility rates in an emerging country never implies an absolute reduction of the total population. It simply hopes for a more reasonable balance between birth and death rates. And since death rates in the future are certain to drop with continued advances in medicine . . . there are no grounds whatever for fearing that a nation's population, under the influence of family planning, will dangerously ebb away. . . .

A still more prevalent myth is the misapprehension that official programs of family planning in a developing country are wholly unnecessary since the very process of development itself automati-

cally leads to lowered birth rates. The experience of Europe is cited as persuasive proof of this theory.

But the proof is no proof at all. . . . There are no comparable circumstances between what happened in Europe's early period of modernization, and what is happening in the emerging world today.

The historical fact is that conditions in Europe during its initial developmental period were far more favorable to lower rates of population growth. The birth rates were much lower than they are in the underdeveloped world today, the death rates had not yet drastically fallen, and by the time public health measures had accomplished that, the infrastructure of industrialization was already in place.

Further, in nineteenth century Europe, unlike in the developing countries today, marriages were entered into later, and the level of literacy—always an important factor affecting population growth—was considerably higher.

With family planning . . . What is feasible—indeed what is imperative—is the establishment of family planning on a scale that will stave off total economic and political disintegration in those countries where social progress is being seriously limited by the glut of unwanted births.

Another serious misunderstanding is the fear that family planning in the developing world would inevitably lead to a breakdown of familial moral fiber. . . .

But one stroll through the slums of any major city in the developing world is enough to dispel that concept. If anything is threatening the fiber of family life it is the degrading conditions of subsistence survival that one finds in these sprawling camps of packing crates and scrap metal. Children on the streets instead of in non-existent classrooms. Broken men—their pride shattered—without work. Despondent mothers—often unmarried—unable to cope with exhaustion because of annual pregnancies. And all of this in a frustrating environment of misery and hunger and hopelessness. These are not the conditions that promote an ethically fibered family life.

Family planning is not designed to destroy families. On the contrary, it is designed to save them.

Nor need anyone be deterred from appropriate action by the pernicious, if pervasive, myth that the white western world's assistance in family planning efforts among the non-white nations of the developing areas is a surreptitious plot to keep the whites in a racial ascendancy. The myth is absurd on purely demographic grounds, as well as on many others. Non-white peoples on the planet massively outnumber whites. They always have and always will. No conceivable degree of family planning could possibly alter that mathematical fact.

But a more relevant answer is that if the white world actually did desire to plot against the non-white nations, one of the most effective ways possible to do so would be for the whites to deny these nations any assistance whatever in family planning. For the progressive future of the non-white world is directly related to their indigenous economic development—and that, in turn, as we have

28 MAKE UP YOUR OWN MIND III

seen, is dependent upon their being able to bring birth rates down to a level that will allow a significant increase in per capita income.

—From a speech at the University of Notre Dame, May 1, 1969.

A Technology for the Earth's Poor

By IVAN ILLICH

It is now common to demand that the rich nations convert their war machine into a program for the development of the Third World. The poorer four fifths of humanity multiply unchecked while their per capita consumption actually declines. This population expansion and decrease of consumption threaten the industrialized nations, who may still, as a result, convert their defense budgets to the economic pacification of poor nations. And this in turn could produce irreversible despair, because the plows of the rich can do as much harm as their swords. U.S. trucks can do more lasting damage than U.S. tanks. It is easier to create mass demand for the former than for the latter. Only a minority needs heavy weapons, while a majority can become dependent on unrealistic levels of supply for such productive machines as modern trucks. Once the Third World has become a mass market for the goods, products, and processes which are designed by the rich for themselves, the discrepancy between demand for these Western artifacts and the supply will increase indefinitely.

We have embodied our world view into our institutions and are now their prisoners. Factories, news media, hospitals, governments, and schools produce goods and services packaged to contain our view of the world. We—the rich—conceive of progress as the expansion of these establishments. We conceive of heightened mobility as luxury and safety packaged by General Motors or Boeing. We conceive of improving the general well-being as increasing the supply of doctors and hospitals, which package health along with protracted suffering. We have come to identify our need for further learning with the demand for ever longer confinement to classrooms. In other words, we have packaged education with custodial care, certification for jobs, and the right to vote, and wrapped them all together with indoctrination in the Christian, liberal, or communist virtues.

In less than a hundred years industrial society has molded patent solutions to basic human needs and converted us to the belief that man's needs were shaped by the Creator as demands for the products we have invented. . . . The consumer is trained for obsolescence, which means continuing loyalty toward the same producers who will give him the same basic packages in different quality or new wrappings.

Industrialized societies can provide such packages for personal consumption for most of their citizens, but this is no proof that these societies are sane, or economical, or that they promote life. The contrary is true. The more the citizen is trained in the consumption of packaged goods and services, the less effective he seems to

become in shaping his environment. His energies and finances are consumed in procuring ever new models of his staples, and the environment becomes a by-product of his own consumption habits.

Rich nations now benevolently impose a straightjacket of traffic jams, hospital confinements, and classrooms on the poor nations, and by international agreement call this "development." The rich and schooled and old of the world try to share their dubious blessings by foisting their pre-packaged solutions on the Third World. Traffic jams develop in São Paulo, while almost a million northeastern Brazilians flee the drought by walking 500 miles . . .

Each car which Brazil puts on the road denies fifty people good transportation by bus. Each merchandised refrigerator reduces the chance of building a community freezer. Every dollar spent in Latin America on doctors and hospitals costs a hundred lives, to adopt a phrase of Jorge de Ahumada, the brilliant Chilean economist. Had each dollar been spent on providing safe drinking water, a hundred lives could have been saved. . . .

Continued technological refinements of products which are already established on the market frequently benefit the producer far more than the consumer. The more complex production processes tend to enable only the largest producer to continually replace outmoded models, and to focus the demand of the consumer on the marginal improvement of what he buys, no matter what the concomitant side effects: higher prices, diminished life span, less general usefulness, higher cost of repairs. Think of the multiple uses for a simple can opener, whereas an electric one, if it works at all, opens only some kinds of cans, and costs one hundred times as much.

The world is reaching an impasse where two processes converge: ever more men have fewer basic choices. The increase in population is widely publicized and creates panic. The decrease in fundamental choice causes anguish and is consistently overlooked. The population explosion overwhelms the imagination, but the progressive atrophy of social imagination is rationalized as an increase of choice between brands. The two processes converge in a dead end: the population explosion provides more consumers for everything from food to contraceptives, while our shrinking imagination can conceive of no other ways of satisfying their demands except through the packages now on sale in the admired societies.

I will focus successively on these two factors, since, in my opinion, they form the two coordinates which together permit us to define underdevelopment.

In most Third World countries, the population grows, and so does the middle class. Income, consumption, and the well-being of the middle class are all growing while the gap between this class and the mass of people widens. Even where per capita consumption is rising, the majority of men have less food now than in 1945, less actual care in sickness, less meaningful work, less protection. This is partly a consequence of polarized consumption and partly caused by the breakdown of traditional family and culture. More people suffer from hunger, pain, and exposure in 1969 than they did at

30 MAKE UP YOUR OWN MIND III

the end of World War II, not only numerically, but also as a percentage of the world population.

These concrete consequences of underdevelopment are rampant; but underdevelopment is also a state of mind, and understanding it as a state of mind, or as a form of consciousness, is the critical problem. Underdevelopment as a state of mind occurs when mass needs are converted to the demand for new brands of packaged solutions which are forever beyond the reach of the majority. Underdevelopment in this sense is rising rapidly even in countries where the supply of classrooms, calories, cars, and clinics is also rising. The ruling groups in these countries build up services which have been designed for an affluent culture; once they have monopolized demand in this way, they can never satisfy majority needs.

The translation of social goals into levels of consumption is not limited to only a few countries. Across all frontiers of culture, ideology, and geography today, nations are moving toward the establishment of their own car factories, their own medical and normal schools—and most of these are, at best, poor imitations of foreign and largely North American models.

The only feasible answer to ever-increasing underdevelopment is a response to basic needs that is planned as a long-range goal for areas which will always have a different capital structure. It is easier to speak about alternatives to existing institutions, services, and products than to define them with precision. It is not my purpose either to paint a Utopia or to engage in scripting scenarios for an alternate future. We must be satisfied with examples indicating simple directions that research should take.

Some such examples have already been given. Buses are alternatives to a multitude of private cars. Vehicles designed for rough transportation on rough terrain are alternatives to standard trucks. Safe water is an alternative to high-priced surgery. Medical workers are an alternative to doctors and nurses. Community food storage is an alternative to expensive kitchen equipment. Other alternatives could be discussed by the dozen. Why not, for example, consider walking as a long-range alternative for locomotion by machine, and explore the demands which this would impose on the city planner? And why can't the building of shelters be standardized, elements be pre-cast, and each citizen be obliged to learn in a year of public service how to construct his own sanitary housing?

This counter-research on fundamental alternatives to current pre-packaged solutions is the element most critically needed if the poor nations are to have a livable future. Such counter-research is distinct from most of the work done in the name of the "year 2000," because most of that work seeks radical changes in social patterns through adjustments in the organization of an already advanced technology. The counter-research of which I speak must take as one of its assumptions the continued lack of capital in the Third World.

There is a normal course for those who make development policies, whether they live in North or South America, in Russia or Israel. It is to define development and to set its goals in ways with which they are familiar, which they are accustomed to use in

order to satisfy their own needs, and which permit them to work through the institutions over which they have power or control. This formula has failed, and must fail. There is not enough money in the world for development to succeed along these lines, not even in the combined arms and space budgets of the super-powers.

—From "Outwitting the 'Developed' Countries," in THE NEW YORK REVIEW OF BOOKS, November 6, 1969. © 1969. Reprinted by permission.

The Economic Impact of Zero Population Growth

Dedicated environmentalists may greet with joy the news that for the first time in recorded history the fertility rate in the United States has dropped to the replacement level. That means 2.1 children for every woman of child-bearing age. If such a level could be sustained for some 70 years, the experts say, the country would have achieved zero population growth.

The term "ZPG" has been increasingly in vogue recently as a result of earnest propaganda campaigning by those who fear the world's environment is endangered by the pressures of a population growth out of control. They foresee disaster unless family size is held to no more than two children per couple.

Demographers are careful to point out that the birth rate can swing up as suddenly as it has dipped in the last five years. (Birth rate is not the same as the fertility rate, which measures the birth expectations of women in the child-bearing ages.) But, if zero population growth is achieved, all current bets regarding this nation's economic future would have to be called off.

The highly complicated U.S. economic system runs on consumer power. For a long time it has depended on rapid growth. Business and industry are conditioned to thinking in terms of more and more customers, and they base their decisions regarding expansion on this trend, but if growth disappears and the population becomes stabilized, there will have to be some jolting reappraisals by all sectors of the economy. For one thing, arriving at ZPG any time in the near future would require a substantial decline in population in the younger ages—unless for some reason there should be a surge in deaths.

Much of the nation's economy is oriented around providing goods and services to the young—baby food, toys, games, bicycles, juvenile clothing, sports equipment, records, school furniture and supplies, and so forth. The list is endless. A drop in demand in these areas would reduce the number of jobs available, especially for young people entering the labor force in coming years.

Eliminating jobs for millions of potential taxpayers would have a profound effect on government revenues and on the programs the federal government now finances, either wholly or in part. A really serious problem would develop with the social security system,

32 MAKE UP YOUR OWN MIND III

which assumes increasing numbers of taxpayers to help finance higher and higher benefits for a growing population of the elderly.

The supreme irony, for the environmentalists, at least, would be a reduced capability for coping with pollution. Without a strong economy, there would be fewer funds available, in either the public or private sector, to clean up the environment.

—From an Editorial in THE DAILY OKLAHOMAN, © July 26, 1972, by Oklahoma Publishing Co. Reprinted by permission.

We do not by any means intend to suggest that the "ecology crisis" does not exist; we do insist that the crisis be seen for what it actually is. We denounce the ideological defense of capitalist economic and social relations that is the unifying element of the so-called "ecology movement," from the "moderate" anti-technology stand of Barry Commoner, to the rabid and hysterical anti-human approach of MIT's Meadows and Forrester.

The ecology crisis is actually subsumed by the general breakdown of capitalist economic relations and therefore only adequately comprehended in such connection. The question of ecological and developmental problems in the Soviet Union as an apparent refutation of this position often arises immediately. To merely indicate the solution here the Soviet Union and East European economies must be seen for what they actually are: worker state sub-sectors of the world capitalist economy trying to defend their limited existence in a profoundly economically hostile environment.

Successful human evolution has been characterized by periodic "productive revolutions" where mere quantitative extensions of man's "energy capturing" capacities have led to qualitative transformations of established modes of life, and thus repeatedly saved mankind from apparently "inevitable crises." The revolution which produced the human species as such, the invention of agriculture, the steam engine, nuclear power, all have created the so-called natural resources from previously "useless" nature.

Under the reign of capitalism humanity has produced countless revolutions of productive technology. If this process could continue unabated there would be no real, material basis in need for socialism, but such is not the case. The pressing question of alternatives to the finite supply of fossil fuels, to supply the ever-expanding need of developing humanity for energy, reveals the incapacity of capitalist economy.

It is not surprising that Zero Growth advocates give short shrift to the possibilities for developing a practical plasma fusion reactor for the production of electrical energy. The fusion of the nuclei within a deuterium (or deuterium-tritium) plasma releases enormous energy but yields no dangerous radio-active waste products . . .

Whereas in a rational world the "ecology movement" would jump on such a development and lend all its efforts toward propagandiz-

ing the need for development of fusion power, in the "real" world it is not merely that such a development would dissolve the case for Zero Growth that these warriors are mum on the subject. They cannot see the development of fusion power as a real possibility because it is not on the immediate capitalist investment agenda. Having limited themselves entirely to the outlook of the actual capitalist future, ZPGers can see no future that does not include stagnation of productive technology.

While vast expenditures of productive resources will be required to develop fusion power as a practical source of energy, the utility industry, eating itself through government porkbarrels in the form of "welfare" measures, such as "oil depletion allowances" and enormous capital advances by the AEC in the development of fission power, is spending next to nothing on fusion research . . .

The zero growth ecologists, however, are at least consistent with reality in their pessimism as long as they view capitalist social and economic relations as the only reality. But they are unwittingly (or not, as the particular case or morality is concerned) projecting capitalist relations of production into the future to predict a crisis which is already upon us. Not only are they doing that; they are embracing its negative aspects (stagnation of production and population) as a solution, while falsifying and hiding from criticism the actually crippling nature of capitalist "economic growth."

Socialism, not having to maintain fictitious inflated value of past capital investments, will be able to carry out rapid industrialization of the underdeveloped world on the basis of re-industrialization of the stagnated "advanced" economies, and thus will be able to generate the required sufficient social surplus to rapidly improve world-wide living standards, while cleaning up the environment and maintaining it in a productive state. It will also be able to develop technical advances such as fusion power production which will create vast new (previously unexploitable) resources and give us capacities for recycling existing industrial materials.

Only a society based on continued, expanding material control over nature will produce the genius required to prevent our self-destruction. So-called "equilibrium economy" or "no-growth economy" only exists, or could exist, under present conditions of vast material deprivation, as disastrous stagnation. We have evidence enough of this fact as capitalist breakdown repeatedly produces "no-growth economy" for us in periodic depressions.

-From "Blue Print for Extinction" by The National Caucus of Labor committees, July, 1972.

Poverty Amidst Plenty

. . . however slight the growth rate, a population cannot grow indefinitely. It follows, therefore, that at some point it must stabilise of its own volition, or else be cut down by some "natural" mechan-

34 MAKE UP YOUR OWN MIND III

ism . . . it must choose to stabilise. To do this it must have some idea of its optimum size, since again it is unlikely that any sane society would choose to stabilise above (or indeed below) it.

The two main variables affected by population numbers, as opposed to *per capita* consumption, are the extent to which the emotional needs and social aspirations of the community can be met (i.e. the complex of satisfactions which has come to be known as the quality of life), and the community's ability to feed itself. . . . it would be unwise in the present state of our knowledge to rely on quality of life judgements when calculating the optimum population. Fortunately, we know much more about feeding ourselves, and assessment of the optimum becomes a realisable task if we base it on the simple ecological concept of the carrying capacity of the land. . . .

While they cannot grow indefinitely, populations can remain above the optimum—indeed above the sustainable maximum—for some time. The fact that the global population, including that of Britain, is above both levels, means only that our numbers are preventing the optimisation of other values. It means that while most people receive the bare minimum of calories necessary for survival, a large proportion are deprived of the nutrients (especially protein) essential for intellectual development. They are alive, but unable to realise their full potential—which is the grossest possible waste of human resources. An optimum population, therefore, may be defined as one that can be sustained indefinitely and at a level at which the other values of its members are optimised—and the fact that we are above this level does not justify despair, but does justify a great sense of urgency in working towards our long-term goal of the optimum. For it is obvious that given the dynamic of population growth, even if all nations today determined to stabilise their populations, numbers would continue to rise for some considerable time. Clearly we must go all out for the “unlikely event” of achieving the replacement-sized family (an average of about two children per couple) *throughout the world by the end of this century*, if our children are not to suffer the catastrophes we seek to avoid.

Our task is to end population growth by lowering the rate of recruitment so that it equals the rate of loss. A few countries will then be able to stabilise, to maintain that ratio; most others, however, will have to slowly *reduce* their populations to a level at which it is sensible to stabilise. Stated baldly, the task seems impossible; but if we start now, and the exercise is spread over a sufficiently long period of time, then we believe that it is within our capabilities. The difficulties are enormous, but they are surmountable.

First, governments must acknowledge the problem and declare their commitment to ending population growth; this commitment should also include an end to immigration. Secondly, they must set up national population services with a fourfold brief:

to publicise as widely and vigorously as possible the relationship between population, food supply, quality of life, resource depletion, etc., and the great need for couples to have no more than two children . . . the notion (derived largely from the popular women's magazines) that childless couples should be objects of pity rather

than esteem should be sharply challenged; and of course there are many similar notions to be disputed.

to provide at local and national levels free contraception advice and information on other services such as abortion and sterilisation;

to provide a comprehensive domiciliary service, and to provide contraceptives free of charge, free sterilisation, and abortion on demand;

to commission, finance, and coordinate research not only on demographic techniques and contraceptive technology, but also on the subtle cultural controls necessary for the harmonious maintenance of stability. We know so little about the dynamics of human populations that we cannot say whether the first three measures would be sufficient. . . .

Increases in food production in the undeveloped world have barely kept abreast of population growth. Such increases as there have been are due not to higher productivity but to the opening up of new land for cultivation. Unfortunately this will not be possible for much longer: . . . according to the FAO, [Food and Agricultural Organization, a specialized agency of the U.N.] at present rates of expansion none of the marginal land that is left will be unfarmed by 1985—indeed some of the land now under cultivation has been so exhausted that it will have to be returned to permanent pasture.

For this reason, FAO's programme to feed the world depends on a programme of intensification, at the heart of which are the new high-yield varieties of wheat and rice.

Whatever their virtues and faults, the new genetic hybrids are not intended to solve the world food problem, but only to give us time to devise more permanent and realistic solutions. It is our view, however, that these hybrids are not the best means of doing this, since their use is likely to bring about a reduction in overall diversity, when the clear need is to develop an agriculture diverse enough to have long-term potential. We must beware of those "experts" who appear to advocate the transformation of the ecosphere into nothing more than a food-factory for man. The concept of a world consisting solely of man and a few favoured food plants is so ludicrously impracticable as to be seriously contemplated only by those who find solace in their own wilful ignorance of the real world of biological diversity. . . .

-From "Blueprint for Survival," © 1970 by ECOLOGIST MAGAZINE. Reprinted by permission.

4

Technology and the Uses of Man (Is More Better?)

The Conservationist's Lament

The world is finite
Resources are scarce
Things are bad
And will be worse
Coal is burnt
And gas exploded
Forests cut
And soils eroded
Wells are drying
Air's polluted
Dust is blowing
Tree's uprooted
Oil is going
Ores depleted
Drains receive
What is excreted
Land is sinking
Seas are rising
Man is far
Too enterprising
Fire will rage
With man to fan it
Soon we'll have
A Plundered Planet
People breed
Like fertile rabbits
People have
Disgusting habits

MORAL

The evolutionary plan
Went astray
By evolving Man

The Technologist's Reply

Man's potential
Is quite terrific
You can't go back
To the Neolithic
The cream is there
For us to skim it
Knowledge is power
And the sky's the limit
Every mouth
Has hands to feed it
Food is found
When people need it
All we need
Is found in granite
Once we have
The men to plan it
Yeast and Algae
Give us meat
Soil is almost
Obsolete
Man can grow
To pastures greener
Till all the earth
Is Pasadena

MORAL

Man's a nuisance
Man's a crackpot
But only man
Can hit the jackpot

By DR. KENNETH BOULDING, 1955

Resources and Wants

By C. E. AYRES

Economics, it seems, is limited to "the impact of human wants upon the limited resources of nature." For the economist both the resources and the wants are "given." They are "primary data." This statement of the case represents a sincere attempt to approach the problems of economics in the spirit of scientific objectivity and caution, and is all the more remarkable on that account. For neither

wants nor resources are "primary data" in the sense that no one can say any more about them than that they are what they are; . . . If anything is known anywhere in the field of the social sciences today, it is that "wants" are not primary. They are not inborn physical mechanisms and they are certainly not spiritual attributes. They are social habits. For every individual their point of origin is in the mores of his community; and even these traditions have a natural history and are subject to modification in the general process of social change. No business man assumes that "wants" are "given." One of the axioms of business is that markets must be created. Resources also are not fixed by the "niggardliness of nature." They are defined by the state of the industrial arts. Every thoughtful and informed student can enumerate resources which have come into being within his lifetime as the result of new scientific discoveries and technological processes.

. . . All that economic thinking has hitherto been obliged to exclude and reject—all that is excluded when it is assumed that "wants" are "primary" and that "scarcity" is defined by "nature"—all that we know today of social change, including the factors which actually shaped the industrial revolution: all this stands ready for assimilation into modern economics. . . .

In this process, materials—what economists have so misleadingly designated as "natural" resources—function as devices. According to the principle of indestructibility of matter there is no such thing as a "new" material. Helium gas must have been present in the earth of the Texas panhandle geologic ages before man first invaded the Western hemisphere some thousands of years ago. Nevertheless helium was not a "natural resource" of the republic of Texas, inasmuch as helium was not identified in the sun for many years after the end of the republic, nor isolated from the earth's atmosphere for many years after that, nor discovered to be a component of Texas natural gas until still later, nor treated as a resource until it was used in balloons only a few years ago. The history of every material is the same. It is one of novel combination of existing devices and materials in such a fashion as to constitute a new device or a new material or both. This is what it means to say that natural resources are defined by the prevailing technology, a practice which is now becoming quite general among economists to the further confusion of old ways of thinking (since it involves a complete revision of the concept of "scarcity" which must now be regarded as also defined by technology and not by "nature").

Furthermore, as regards the nature of the process there is no difference between "mechanical" invention and "scientific" discovery. Scientific discoveries also result from the combination of previously existing devices and materials, laboratory instruments and techniques. . . .

. . . This principle of combination is important by virtue of the light it throws on previous obscurities. One of these is the role of chance in discovery and invention. An extraordinary number of the most significant discoveries have been made by chance. Columbus discovered America by accident. Ostensibly he was sailing toward the Indies. The discovery of the X-ray resulted from the exposure of sealed photographic plates by their accidental juxtaposition to a Crookes tube. . . .

38 MAKE UP YOUR OWN MIND III

But what do we mean by "chance" or "accident"? These words are of course relational. In a sense nothing occurs by chance, but some events are less relevant than others to any given point of reference. In all these cases the point of reference is the previous activities of some individual. The discovery of America was "accidental" with reference to the intentions of Columbus; but it was not accidental that it should have occurred in 1492. The arts of shipbuilding, seamanship, and navigation being what they were by the end of the fifteenth century, somebody was "bound" to have "discovered America" within a decade or so; and this also is true of inventions and discoveries generally. The lore of science and mechanics is full of simultaneous discoveries, often by several agents and as a result of strikingly similar combinations. . . .

These combinations are physical not less than ideational. To be sure they are achieved by men, usually by men of great ability. But the things they put together are physical objects. The coexistence of these objects constitutes a possibility of combination which transcends the acts of any individual. It is in this sense that inventions seem "bound" to occur. . . .

— From *"The Theory of Economic Progress"* by C. E. Ayres. © By THE UNIVERSITY OF NORTH CAROLINA PRESS. Available in Paperback from Schocken Books, New York City.

A Fundamental Extension in Morality

By DR. GARRETT HARDIN

In our day (though not in earlier times) technical solutions are always welcome. Because of previous failures in prophecy, it takes courage to assert that a desired technical solution is not possible. . . . The concern here is with the important concept of a class of human problems which can be called "no technical solution problems."

It is easy to show that the class is not a null class. Recall the game of ticktacktoe. Consider the problem, "How can I win the game of ticktacktoe?" It is well known that I cannot, if I assume (in keeping with the conventions of game theory) that my opponent understands the game perfectly. Put another way, there is no "technical solution" to the problem. I can win only by giving a radical meaning to the word "win." I can hit my opponent over the head; or I can drug him; or I can falsify the records. Every way in which I "win" involves, in some sense, an abandonment of the game, as we intuitively understand it. (I can also, of course, openly abandon the game—refuse to play it. This is what most adults do.)

Population, as Malthus said, naturally tends to grow "geometrically," or, as we would now say, exponentially. In a finite world this means that the per capita output of the world's goods must steadily decrease. Is ours a finite world?

A fair defense can be put forward for the view that the world is infinite; that we do not know that it is not. But, in terms of the practical problems that we must face in the next few generations with the foreseeable technology, it is clear that we will greatly increase human misery if we do not, during the immediate future, assume that the world available to the terrestrial human population is finite. "Space" is no escape.

A finite world can support only a finite population; therefore, population growth must eventually equal zero. . . .

. . . in real life incommensurables are commensurable. Only a criterion of judgment and a system of weighting are needed. In nature the criterion is survival. Is it better for a species to be small and hideable, or large and powerful? Natural selection commensurates the incommensurables. The compromise achieved depends on a natural weighting of the values of the variables.

Man must imitate this process. There is no doubt that in fact he already does, but unconsciously. It is when the hidden decisions are made explicit that the arguments begin. The problem for the years ahead is to work out an acceptable theory of weighting. . . .

The rebuttal to the visible hand in population control is to be found in a scenario first sketched in a little-known pamphlet in 1833 by a mathematical amateur named William Forster Lloyd (1794—1852). We may well call it "the tragedy of the commons,"

. . . .
The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy.

As a rational being, each herdsman seeks to maximize his gain. Explicitly or Implicitly, more or less consciously, he asks, "What is the utility to me of adding one more animal to my herd?" This utility has one negative and one positive component.

1. The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly $+1$.

2. The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsmen, the negative utility for any particular decisionmaking herdsman is only a fraction of -1 .

Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. Another; and another. . . . But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit—in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.

Some would say that this is a platitude. Would that it were. In a sense, it was learned thousands of years ago, but natural selection favors the forces of psychological denial. The individual benefits as

an individual from his ability to deny the truth even though society as a whole, of which he is a part, suffers. Education can counteract the natural tendency to do the wrong thing, but the inexorable succession of generations requires that the basis for this knowledge be constantly refreshed. . . .

In a reverse way, the tragedy of the commons reappears in problems of pollution. Here it is not a question of taking something out of the commons, but of putting something in—sewage, or chemical, radioactive, and heat wastes into water; noxious and dangerous fumes into the air; and distracting and unpleasant advertising signs into the line of sight. The calculation of utility are much the same as before. The rational man finds that his share of the cost of the wastes he discharges into the commons is less than the cost of purifying his wastes before releasing them. Since this is true for everyone, we are locked into a system of "fouling our own nest," so long as we behave only as independent, rational, free-enterprisers.

The tragedy of the commons as a food basket is averted by private property, or something formally like it. But the air and waters surrounding us cannot readily be fenced, and so the tragedy of the commons as a cesspool must be prevented by different means, by coercive laws or taxing devices that make it cheaper for the polluter to treat his pollutants than to discharge them untreated. We have not progressed as far with the solution of this problem as we have with the first. Indeed, our particular concept of private property, which deters us from exhausting the positive resources of the earth, favors pollution. The owner of a factory on the bank of a stream—whose property extends to the middle of the stream—often has difficulty seeing why it is not his natural right to muddy the waters flowing past his door. The law, always behind the times, requires elaborate stitching and fitting to adapt it to this newly perceived aspect of the commons. . . .

Analysis of the pollution problem as a function of population density uncovers a not generally recognized principle of morality; namely, the morality of an act is a function of the State of the system at the time it is performed. Using the commons as a cesspool does not harm the general public under frontier conditions, because there is no public; the same behavior in a metropolis is unbearable. A hundred and fifty years ago a plainsman could kill an American bison, cut out only the tongue for his dinner, and discard the rest of the animal. He was not in any important sense being wasteful. Today, with only a few thousand bison left, we would be appalled at such behavior. . . .

That morality is system-sensitive escaped the attention of most codifiers of ethics in the past. "Thou shalt not * * *" is the form of traditional ethical directives which make no allowance for particular circumstances. The laws of our society follow the pattern of ancient ethics, and therefore are poorly suited to governing a complex, crowded, changeable world. Our epicyclic solution is to augment statutory law with administrative law. Since it is practically impossible to spell out all the conditions under which it is safe to burn trash in the backyard or to run an automobile without smog

control, by law we delegate the details to bureaus. The result is administrative law, which is rightly feared for an ancient reason—*Quis custodiet ipsos custodes?*—"Who shall watch the watchers themselves?" John Adams said that we must have "a government of laws and not men." Bureau administrators, trying to evaluate the morality of acts in the total system, are singularly liable to corruption, producing a government by men, not laws.

Prohibition is easy to legislate (though not necessarily to enforce); but how do we legislate temperance? Experience indicates that it can be accomplished best through the mediation of administrative law. We limit possibilities unnecessarily if we suppose that the sentiment of *Quis custodiet* denies us the use of administrative law. We should rather retain the phrase as a perpetual reminder of fearful dangers we cannot avoid. The great challenge facing us now is to invent the corrective feedbacks that are needed to keep custodians honest. We must find ways to legitimate the needed authority of both the custodians and the corrective feedbacks. . . .

Perhaps the simplest summary of this analysis of man's population problems is this: the commons, if justifiable at all, is justifiable only under conditions of low-population density. As the human population has increased, the commons has had to be abandoned in one aspect after another.

First we abandoned the commons in food gathering, enclosing farmland and restricting pastures and hunting and fishing areas. These restrictions are still not complete throughout the world.

Somewhat later we saw that the commons as a place for waste disposal would also have to be abandoned. Restrictions on the disposal of domestic sewage are widely accepted in the Western World; we are still struggling to close the commons to pollution by automobiles, factories, insecticide sprayers, fertilizing operations, and atomic energy installations.

In a still more embryonic state is our recognition of the evils of the commons in matters of pleasure. There is almost no restriction on the propagation of sound waves in the public medium. The shopping public is assaulted with mindless music, without its consent. Our Government is paying out billions of dollars to create supersonic transport which will disturb 50,000 people for every one person who is whisked from coast-to-coast 3 hours faster. Advertisers muddy the airwaves of radio and television and pollute the views of travelers. We are a long way from outlawing the commons in matters of pleasure. Is this because our Puritan inheritance makes us view pleasure as something of a sin, and pain (that is, the pollution of advertising) as the sign of virtue?

Every new enclosure of the commons involves the infringement of somebody's personal liberty. Infringements made in the distant past are accepted because no contemporary complains of a loss. It is the newly proposed infringements that we vigorously oppose; cries of "rights" and "freedom" fill the air. But what does "freedom" mean? When men mutually agreed to pass laws against robbing, mankind became more free, not less so. Individuals locked into the logic of the commons are free only to bring on universal ruin; once they see the necessity of mutual coercion, they become

42 MAKE UP YOUR OWN MIND III

free to pursue other goals. I believe it was Hegel who said, "Freedom is the recognition of necessity."

The most important aspect of necessity that we must now recognize, is the necessity of abandoning the commons in breeding. No technical solution can rescue us from the misery of overpopulation. Freedom to breed will bring ruin to all. At the moment, to avoid hard decisions many of us are tempted to propagandize for conscience and responsible parenthood. The temptation must be resisted, because an appeal to independently acting consciences selects for the disappearance of all conscience in the long run, and an increase in anxiety in the short.

-From "THE TRAGEDY of the COMMONS" in SCIENCE MAGAZINE, ©December 13, 1968. Reprinted by permission.

Is More Better?

By RUSSELL E. TRAIN

Across the country, Americans are themselves asking in many ways whether more is really better. Communities from Vermont to Florida to Colorado to California to Oregon are increasingly willing to forego new industries or particular kinds of industries to prevent impairment of the local environment. . . .

One need not accept the dire hypotheses and methods underlying some of the more extreme predictions to acknowledge the fundamental validity of the questions these various groups are asking. They are questions which touch upon public policy choices in several fields, and most economy. We must ask whether the market allocates long-term needs in an effective manner or whether prices only rise as a resource is close to depletion. Instead of dismissing these matters with an ideological reflex, we must apply careful analysis, for it is by no means clear that the marketplace and technology will solve all of our problems in an even-handed manner.

. . . Can we reply upon technology to continue to increase at the same rate as population and, if we can, what will be the side effects of technological progress? Acceleration of growth demands that new technology developments increase at least as rapidly as population growth. Yet we may create new problems as technologies are introduced without proper testing and analysis of their implications. These questions underscore the great need for technology assessment. Technology assessment should deal not only with hardware items like new energy technology and transportation technology, but should also explore the implications of monocultural agricultural systems, information technology and its impacts on privacy, and the like. . . .

Perhaps the most perplexing problem facing any growth strategy is how to continue to maintain a high quality of life and meaningful employment opportunities without the continued burgeoning of the production of goods. The challenge will obviously entail improvements in services, education, the arts and recreation, and probably

with greater amounts of leisure time. It may well be possible actually to lower production and yet maintain the same level of goods satisfaction through production of longer lived goods.

I personally believe that the waning of the work ethic in this country and the high level of worker dissatisfaction, particularly in such relatively high-pay industries as auto manufacturing, stem from our having subordinated human contentment to industrial processes. Unfortunately, we are not likely to begin to reorganize the work environment until discontent is perceived to affect the primary economic goal of producing a salable product. At that time perhaps we will move to allow smaller work groups, more handcrafted and better products and more diverse functions for each worker, than the assembly line now permits. As Jean Jacques Revel has pointed out, the willingness to question the purposes and uses of technology is at the heart of the environmental movement. . . .

. . . Most of the earth's resources are plentiful in total, but their numbers are limited using current methods of extraction. As resources become scarce, their prices will go up and substitutes will be sought or new mining methods employed. . . .

-From Commencement Address, Oklahoma State University, May 13, 1972.

National Goals and National Welfare

By COUNCIL OF ECONOMIC ADVISORS

The American economy has created new jobs and produced marvels of abundance in the past. It should be able to do so in equal or even greater degree in the future. It should be able to do so in equal or even greater degree in the future. Our population is rapidly increasing, educational levels are rising, work skills are improving, incomes are widely distributed, consumers are eager to improve their living standards, businessmen are actively engaged in starting new enterprises and expanding old ones, the tools of industry are multiplying and improving, research and technology are constantly opening up new opportunities, and our public policies generally encourage enterprise and innovation. With so many favorable factors, a continuation of rapid economic growth may reasonably be expected.

An arithmetical calculation, based on a number of technical projections, the most important being that the average annual gains in production we have had in recent times will occur in the future, shows that our country can within a decade increase its production from a current annual level of about 360 billion dollars to 500 billion or more, with the figures expressed in dollars of the same buying power. Of course, the record of the past sets no limit to our future achievements. Nor should we permit arithmetical projections to obscure the basic fact that an economy succeeds only as people succeed. Our economic future depends on the full use of the great

44 MAKE UP YOUR OWN MIND III

treasure house of intelligence, skill, energy, and confidence of the American people.

A glorious economic future may be ours, but it is not vouchsafed to us. We shall achieve it only by wise management of our national household. In the future as in the past, increases in productivity and in useful employment opportunities will be the core of economic expansion. The tools and equipment used by farm, factory, mine, and office workers must be multiplied and improved. Industrial techniques, materials, and management must become more efficient, and skills and morale enhanced, so that the amount of production for each hour worked will increase. And unless there are satisfactory jobs for those who seek useful employment, and unless human labor is devoted increasingly to the production of goods and services that improve the quality of life, our gains in productivity may be dissipated. . . .

A sound and growing economy is needed also to meet the requirements of our expanding population. There are 32 million more Americans now than at the end of World War II, and the number is increasing at the rate of about 3 million a year. Heavy economic requirements are implied by this increase. A huge expansion of educational personnel and physical facilities will be required to train increasing numbers of students for the higher level of technology on which our security and welfare depend. Our larger population will also require increased facilities for the production and distribution of goods and services, and for health and recreation. Production must expand as fast as population merely to maintain our present consumption standards. Even higher rates will be necessary as these standards rise.

Although the rate of economic growth that is best suited to the Nation's capacity and requirements cannot be stated precisely, the low current rate would clearly be unsatisfactory as a continuing condition. We must always be alert to question the adequacy of the rate of economic growth and to consider whether further encouragement and incentives are needed, and if so how best to provide them. Yet we must be continuously on guard against resort to measures that might provide a spurt in activity at the cost of impairing the long-run health of the economy. . . .

-From PRESIDENT'S ECONOMIC REPORT, January, 1958.

The principal question on the economic outlook for 1973 is not whether, but how fast, output and employment will expand. For policy, there are two issues. The first is to find and implement the set of policy actions which will maximize the likelihood that the economy will move to its full potential level of output and employment. The second is to do so in ways that will serve both to eliminate the vestiges of the post-1965 inflation and to place the economy squarely on a sustainable path of subsequent non-inflationary growth. . . .

Policy beyond 1973 will have to be adaptable to developments during the year. However, in the absence of evidence to the contrary, a sustained period of uninterrupted expansion would provide

the optimal background for maximizing both employment and price stability. To this end, the appropriate policy goal in the ensuing period would seem to be a steady increase of money demand (money GNP) at a rate consonant with the potential growth rate of the economy and reasonable price stability. . . .

It is worth repeating that the policy goal is a condition in which persons who want work and seek it realistically on reasonable terms can find employment. The Government must make two kinds of contribution to the achievement of this goal. First, it must maintain reasonable stability in the overall rate of economic growth so that the efforts of individuals to find work are not frustrated by erratic changes in the conditions on which work is available. Second, it must seek to eliminate obstacles that prevent willing workers and willing employers from getting together, insofar as these obstacles can be overcome without excessive cost. . . .

—From PRESIDENT'S ECONOMIC REPORT, January, 1973.

The Poverty of Physical Abundance

By ROBERT THEOBALD

. . . The past and future growth of production cannot be shrugged off as being merely more of the same. Despite the attempts of more economists to argue that all talk of abundance must be ignored because there will always be some scarcities, it is surely clear that the nature of the real scarcities is changing so rapidly that it is forcing fundamental modification in our society.

In the past, the most basic drive of Western man was to provide himself with the certainty of food, clothing and shelter. To achieve these necessities, he felt justified in constraining almost all the members of the society to toil. Today, we have the technological potential to provide all human beings with their fundamental physical needs: the scarcities we now perceive as being most acute are in terms of time to do what we wish, space in which to do it, and the imagination to solve our problems. . . .

Man today has the ability to reshape his world according to his desires. However, if his desires continue to violate the inherent requirements of his nature or destroy the world's capacity to support him, the human race itself will be destroyed.

In effect, we are ignoring the fundamental dictates of our own nature: apathy and violence are the inevitable results. In addition, the growing destruction of our resources of air, water, land and silence through intentional and unintentional abuse threatens the stability of the world's ecology and, in particular, man's survival on this planet.

We are all trapped in an industrial-age socioeconomic system which no longer serves our needs. Alone, no one has the power to escape from the traps in which we presently find ourselves. We are, in reality, losing the power to control our lives at a time when

46 MAKE UP YOUR OWN MIND III

our growing individual and social awarenesses makes this intolerable.

We now know how to provide all human beings with the food, clothing, and shelter necessary for the freedom to delight in living. Our present ability to perceive, store, and transmit knowledge will facilitate the elimination of scarcity on a global basis but this potential to fulfill man's needs throughout the world can only be realized within a society in which new ideas can be critically and openly examined.

We are moving from an order based on transportation and production to one based on communications, in which decisions and their results become simultaneous. The removal of any opportunity for corrections demands that we develop a society capable of far greater care in making decisions.

None of us who sign this statement believe that we have so far developed the knowledge and wisdom required to resolve or even fully understand, the choices which so urgently confront us. Therefore, we commit ourselves to strive cooperatively toward an understanding of the potentials of the future and thus create a world in which our humanness can be most fully developed.

Inherent in the analysis behind this document is the belief that the crisis in which we now find ourselves is not caused by personalities but it exists because we are driven by a socioeconomic system no longer suited to present conditions. . . .

It is, of course, conventional to blame personalities for the present crisis. This view is, in many ways, more attractive for it permits us to claim that if only we—the good guys—were in power and they—the bad guys—were out of power, all the problems would be eliminated. . . .

Abraham Maslow has argued that with the coming of the potential of abundance, man grows beyond a struggle for food, clothing and shelter and is forced into a drive toward self-awareness. He begins to realize that he should spend his life developing himself and his society. Our present industrial-age system, however, continues to act as though there are no possibilities for individuals: that the individual cannot, indeed should not, escape from the condition in which he finds himself. . . .

—From an address to The American Academy of Political and Social Science, April 5, 1968.

Limitless Expansion

By ALBERT BEVERIDGE

Even self-government is not an end in itself. It is a means to an end. With Anglo-Saxon peoples self-government is the means to the end of individual and collective human happiness. And all the laws of self-governing peoples are just that and nothing more.

Mills, factories, railroads, farms, mines—a thousand forms of

productive industry developed magically; and over all the busy genius of invention brooded, making one hand do that which thousands toiled to do before, fertilizing fields, abbreviating space, extracting gold from hopeless rocks, discovering wealth and human uses in the very refuse of a cruder day.

And so it came to pass that our home market is supplied and the overflowing surplus threatens to choke the very machinery that produces it unless we find a place to sell that surplus. And so it is that to-day Progress speaks a new word of economic truth as needful now as was the old word then. As the "Home market" was the word of wisdom in its season, so "Foreign markets" is the word of wisdom now.

We have more coal, more iron, more skill in workmanship, more ability and experience in organizing capital for productive uses than any other portion of the globe. And so we sell abroad our girders, beams and plates of steel, and the many forms into which wealth and work and genius have fashioned the useful metals. We *must* sell them abroad.

We must sell our fabrics of cotton and of wool abroad; our meats, our flour, and all the stuffs that feed and clothe the human race.

Our own consuming capacity will increase. But while it is increasing, our surplus can not wait. It must be disposed of as it is produced. And, always, there will be a surplus. The capacity of a people for production beyond their own needs is the measure of their increasing wealth. And so, while the increase of our own consuming capacity is important, the development of our foreign markets is indispensable. Both are necessary to the consumption of our ever-increasing production. And of foreign markets, the oriental field is virgin soil and awaits our intelligent cultivation.

Progress said that the prosperity of the people is the end, and local self-government, general government, or any other kind of government nothing but a means. Progress said, "The logic of strict construction is built on words; I demand logic built on facts." And so into the written Constitution, the necessities of national intercourse read the power of the National Government to make internal improvements. And to-day that power is so much a matter of course that not one man in ten thousand knows that that power was originally denied. Thus it was that the spirit of American adaptability triumphed even over the letter of the Constitution.

Business is the great expounder of our fundamental law. Conditions construe our Constitution more completely than all the lawyers who ever lived. Geography, invention, exploration, are continuous interpreters of that great instrument. Mountains, rivers, plains and lakes, railways, telegraphs, the planting of new communities, the discovery of new resources, the interchange of thought and products — to these great human facts the spirit of American adaptability has conformed ancient customs, honored traditions, written constitutions.

—From CONSERVATISM, February 22, 1902.

Neutral Science

By JOHN BURROUGHS

Our civilization is so largely the result of physical science that we almost unconsciously impute all its ugly features to science.

But its ugly features can only indirectly be charged to science. They are primarily chargeable to the greed, the selfishness, the cupidity, the worldly-mindedness which has found in science the tools to further its ends. We can use our scientific knowledge to improve and beautify the earth, or we can use it to deface and exhaust it. We can use it to poison the air, corrupt the waters, blacken the face of the country, and harass our souls with loud and discordant noises, or we can use it to mitigate or abolish all these things. Mechanical science could draw the fangs of most of the engineering monsters that are devouring our souls. The howling locomotives that traverse the land, pouring out their huge black volumes of fetid carbon, and splitting our ears with their discordant noises, only need a little more science to purify their foul breaths and soften their agonizing voices. A great manufacturing town is hideous, and life in it is usually hideous, but more science, more mechanical skill, more soul in capital, and less brutality in labor would change all these things.

Science puts great weapons in men's hands for good or for evil, for war or for peace, for beauty or for ugliness, for life or for death, and how these weapons are used depends upon the motives that actuate us. Science now promises to make war so deadly that it will practically abolish it. While we preach the gospel of peace our preparations for war are so exhaustive and scientific that the military spirit will die of an overdose of its own medicine, and peace will fall of itself like a ripe fruit into our hands. A riotous, wasteful, and destructive spirit has been turned loose upon this continent, and it has used the weapons which physical science has placed in its hands in a brutal, devil-may-care sort of way, with the result that a nature fertile and bountiful, but never kind and sympathetic, has been outraged and disfigured and impoverished, rather than mellowed and subdued and humanized.

The beauty and joy of life in the Old World is a reflection from the past or prescientific age, to a degree of which we have little conception. In spite of our wealth of practical knowledge, and our unparalleled advantages (perhaps by very reason thereof, since humility of spirit is a flower that does not flourish amid such rank growths), life in this country is undoubtedly the ugliest and most materialistic that any country or age ever saw. Our civilization is the noisiest and most disquieting, and the pressure of the business and industrial spirit the most maddening and killing, that the race has yet experienced.

Yet for all these things science is only indirectly responsible. In the same sense is the sun responsible for the rains and storms that at times destroy us. The spirit of greed and violence, robust because

it has been well-housed and fed, and triply dangerous because it is well-armed and drilled, is abroad in the land. Science gave us dynamite, but whence the spirit that uses it to wreak private revenge, or to blow up railroad bridges and newspaper and manufacturing plants? Let us be just to science. Had it never been, the complexion of our lives and the face of the earth itself would have been vastly different. Had man never attained to the power of reason, he would still have been a brute with the other beasts. It takes power to use power. Knowledge without wisdom is a dangerous thing. Science without sense may bring us to grief. We cannot vault into the saddle of the elemental forces and ride them and escape the danger of being ridden by them. We cannot have a civilization propelled by machinery without the iron of it in some form entering our souls.

—*From IN THE SUMMIT of THE YEARS, 1913.*

Technology for What?

By LEWIS MUMFORD

The chief premise common to both technology and science is the notion that there are no desirable limits to the increase of knowledge, of material goods, of environmental control; that quantitative productivity is an end in itself, and that every means should be used to further expansion.

This was a defensible position in the seventeenth century, when an economy of scarcity still prevailed everywhere. Then, each new facility for production, each fresh increment of energy and goods, each new scientific observation or experiment, was needed to make up the terrible existing deficiencies in consumable goods and verifiable knowledge. But today our situation is precisely the opposite of this. Because of the success of the sciences in widening the domain of prediction and control, in penetrating the hitherto inviolable mysteries of nature, in augmenting human power on every plane, we face a new predicament derived from this very economy of abundance: that of deprivation by surfeit. The quantitative overproduction of both material and intellectual goods poses—immediately for the Western World, ultimately for all mankind—a new problem: the problem of regulation, distribution, assimilation, integration, purposeful anticipation and direction.

No one questions the immense benefits already conferred in many departments by science's efficient methodology; but what one must challenge is the value of a system so detached from other human needs and human purposes that the process itself goes on automatically without any visible goal.

Is it not time, then, that we began to ask ourselves certain questions about science as technology? Are we sure that the control of all natural processes by science and technics is by itself an effective way of relieving and improving man's estate? Is it not possible to have a surfeit of inventions, like a surfeit of food—with similar dis-

50 MAKE UP YOUR OWN MIND III

stress to and derangement of the organism? Have we not already evidence to show that science as technology may, through its inordinate growth, become increasingly irrelevant to any human intent whatever, except that of the technologist or the corporate enterprise: that, indeed, as in the form of nuclear or bacterial weapons, or space exploration, it may be not merely coldly indifferent but actively hostile to human welfare?

But I would go further. By what rational canon do we seek to save time, shrink space, augment power, multiply goods, overthrow organic norms, and displace real organisms with mechanisms that simulate them or vastly magnify some single function they perform? All these imperatives, which have become the very groundwork of 'science as technology' in our present society, seem axiomatic and absolute only because they remain unexamined.

A sound and viable technology, firmly related to human needs, cannot be one that has a maximum productivity as its supreme goal: it must, rather, seek as in an organic system, to provide the right quantity of the right quality at the right time and the right place in the right order for the right purpose. To this end, deliberate regulation and direction, in order to ensure continued growth and creativity of the human personalities and groups concerned, must govern our plans in the future, as indefinite expansion and multiplication have done during the last few centuries.

The new industrial complex is based upon a group of postulates so self-evident to those who have produced the system that they are rarely criticized or challenged—indeed almost never examined—for they are completely identified with the new 'way of life.' Let me list these postulates.

First: man has only one all-important mission in life: to conquer nature. By conquering nature the technocrat means, in abstract terms, commanding time and space; and in more concrete terms, speeding up every natural process, hastening growth, quickening the pace of transportation, and breaking down communication distances by either mechanical or electronic means. To conquer nature is in effect to remove all natural barriers and human norms and to substitute artificial, fabricated equivalents for natural processes: to replace the immense variety of resources offered by nature by more uniform, constantly available products spewed forth by the machine.

From these general postulates a series of subsidiary ones are derived: there is only one efficient speed, *faster*; only one attractive destination, *farther away*; only one desirable size, *bigger*; only one rational quantitative goal, *more*. On these assumptions the object of human life, and therefore of the entire productive mechanism, is to remove limits, to hasten the pace of change, to smooth out seasonal rhythms and reduce regional contrasts—in fine, to promote mechanical novelty and destroy organic continuity. Cultural accumulation and stability thus become stigmatized as signs of human backwardness and insufficiency. By the same token, any institution or way of life, any system of education or production that imposes limits, retards change, or converts the imperious will to conquer nature into a relation of mutual aid and rational accom-

modation, threatens to undermine the power-pentagon and the scheme of life derived from it.

Thanks to the proficiency of the machine, the problem of older societies, that of scarcity and insufficiency, was—at least in theory—solved: but a new problem, equally serious but at just the opposite extreme, was raised: the problem of quantity. This problem has many aspects: not merely how to distribute the potential abundance of goods justly, so that the whole community will benefit, but how to allocate the investment in machine-centered organizations without negating or destroying those many human activities and functions that are injured rather than helped by automation.

Even those who see no personal threat from quantification must be prepared to recognize its statistically demonstrable results in the many forms of environmental degradation and ecological unbalance that have resulted from the by-products of our megatechnic economy. The ironic effect of quantification is that many of the most desirable gifts of modern technics disappear when distributed *en masse*, or when—as with television—they are used too constantly and too automatically. So, too, when ten thousand people converge by car on a wild scenic area in a single day to 'get close to nature' the wilderness disappears and megalopolis takes its place.

Megatechnics, so far from having solved the problem of scarcity, has only presented it in a new form even more difficult of solution. Result: a serious deficiency of life, directly stemming from unusable and unendurable abundance. But the scarcity remains: admittedly not of machine-fabricated material goods or of mechanical services, but of anything that suggests the possibility of a richer personal development based upon other values than productivity, speed, power, prestige, pecuniary profit. Neither in the environment as a whole, nor in the individual community or its typical personalities, is there any regard for the necessary conditions favoring balance, growth, and purposeful expression.

In our machine-dominated world, there are plenty of people working at scientific laboratories today who, though they may still call themselves biologists, have no intimate contact with this organic culture and no respect for its achievements. They have already begun to regulate the creative process in accordance with the market demands of the power complex. One of the latest triumphs in plant breeding, for example, has been to develop a variety of tomato which not merely grows to uniform size but ripens in quantity at the same time, in order that the crop may be garnered by an automatic picking and packing machine.

From such preconceptions flow further dreams of an even more tightly ordered world from which all more primitive or non-profitable species and varieties will be eliminated—even though primitive stocks remain essential for creative hybridization. Perhaps only the residual wildness left in man himself, still stirring in his dream life, will now save him from submission to such deadly conformity.

For man to restrict his social activities and his personal fulfillments solely to those that conform to external megatechnic require-

52 MAKE UP YOUR OWN MIND III

ments would be a form of collective suicide and that suicide—or more accurately biocide—is in fact taking place before our eyes. Our elaborate mechanical equipment may be a useful supplement to organic existence; but it is not, except in grave emergencies—as with a mechanical kidney—an acceptable permanent alternative. It is from the organic world in its entirety, not merely from a swollen judgment of man's mind, his technique for handling abstract symbols, that the materials for further development are to be drawn. Once the new organic world picture becomes intelligible and acceptable, the ancient myth of the machine,' from which our compulsive technocratic errors and malfunctions are largely derived, will no longer keep its grip on modern man.

—From *THE MYTH of the MACHINE: THE PENTAGON of POWER*, copyright © 1964, 1970, by Lewis Mumford. Reprinted by permission of Harcourt, Brace Jovanovich, Inc.

5

Land Use and the Good Life

(Living Off the Land)

The Joy of Preserving Nature

By JOHN MUIR

The tendency nowadays to wander in wildernesses is delightful to see. Thousands of tired, nerve-shaken, over-civilized people are beginning to find out that going to the mountains is going home; that wildness is a necessity; and that mountain parks and reservations are useful not only as fountains of timber and irrigating rivers, but as fountains of life. Awakening from the stupefying effects of the vice of overindustry and the deadly apathy of luxury, they are trying as best they can to mix and enrich their own little ongoings with those of Nature, and to get rid of rust and disease. Briskly venturing and roaming, some are washing off sins and cobweb cares of the devil's spinning in all-day storms on mountains; sauntering in rosinny pinewoods or in gentian meadows, brushing through chaparral, bending down and parting sweet, flowery sprays; tracing rivers to their sources, getting in touch with the nerves of Mother Earth; jumping from rock to rock, feeling the life of them, learning the songs of them, panting in wholesouled exercise, and rejoicing in deep, long-drawn breaths of pure wildness. This is fine and natural and full of promise. So also is the growing interest in the care and preservation of forests and wild places in general, and in the half wild parks and gardens of towns.

When, like a merchant taking a list of his goods, we take stock of our wildness, we are glad to see how much of even the most destructible kind is still unspoiled. Looking at our continent as scenery when it was all wild, lying between beautiful seas, the starry sky above it, the starry rocks beneath it, to compare its sides, the East and the West, would be like comparing the sides of a rainbow. But it is no longer equally beautiful. The rainbows of today are, I suppose, as bright as those that first spanned the sky; and some of our landscapes are growing more beautiful from year to year, notwithstanding the clearing, trampling work of civilization. New plants and animals are enriching woods and gardens, and many landscapes wholly new, with divine sculpture and architecture, are just now coming to the light of day as the mantling folds of creative glaciers are being withdrawn, and life in a thousand cheerful, beautiful forms is pushing into them, and newborn rivers are beginning to sing and shine in them. The old rivers, too, are growing longer, like healthy trees, gaining new branches and lakes as the residual

54 MAKE UP YOUR OWN MIND III

glaciers at their highest sources on the mountains recede, while the rootlike branches in their flat deltas are at the same time spreading farther and wider into the seas and making new lands . . .

. . . But the continent's outer beauty is fast passing away, especially the plant part of it, the most destructible and most universally charming of all.

Only 30 years ago, the great Central Valley of California, 500 miles long and 50 miles wide, was one bed of golden and purple flowers. Now it is ploughed and pastured out of existence, gone forever,—scarce a memory of it left in fence corners and along the bluffs of the streams. The gardens of the Sierra, also, and the noble forests in both the reserved and unreserved portions are sadly hacked and trampled, notwithstanding the ruggedness of the topography,—all excepting those of the parks guarded by a few soldiers. In the noblest forests of the world, the ground, once divinely beautiful, is desolate and repulsive, like a face ravaged by disease. Even the great deserts in Arizona, Nevada, Utah, and New Mexico, which offer so little to attract settlers, and which a few years ago pioneers were afraid of, as places of desolation and death, are now taken as pastures at the rate of one or two square miles per cow, and of course their plant treasures are passing away,—the delicate abronias, phloxes, gilias, etc. Only a few of the bitter, thorny, unbitable shrubs are left, and the sturdy cactuses that defend themselves with bayonets and spears.

Most of the wild plant wealth of the East also has vanished,—gone into dusty history. Only vestiges of its glorious prairie and woodland wealth remain to bless humanity in boggy, rocky, unploughable places. . . .

The most extensive least spoiled and most unspoilable of the gardens of the continent are the vast tundras of Alaska.

In the meantime, the wildest health and pleasure grounds accessible and available to tourists seeking escape from care and dust and early death are the parks and reservations of the West. . . . The 40 million acres of these reserves are in the main unspoiled as yet, though sadly wasted and threatened on their more open margins by the axe and fire of the lumberman and prospector, and by hooved locusts, which, like the winged ones, devour every leaf within reach, while the shepherds and owners set fires with the intention of making a blade of grass grow in the place of every tree, but with the result of killing both the grass and the trees. . . .

These grand reservations should draw thousands of admiring visitors at least in summer, yet they are neglected as if of no account, and spoilers are allowed to ruin them as fast as they like. . . . Most travelers here are content with what they can see from car windows or the verandas of hotels, and in going from place to place cling to their precious trains and stages like wrecked sailors to rafts. When an excursion into the woods is proposed, all sorts of dangers are imagined,—snakes, bears, Indians. Yet it is far safer to wander in God's woods than to travel on black highways or to stay at home. The snake danger is so slight it is hardly worth mentioning. Bears are a peaceable people, and mind their own business, instead of going about like the devil seeking whom they may devour.

Poor fellows, they have been poisoned, trapped, and shot at until they have lost confidence in brother man, and it is not now easy to make their acquaintance. As to Indians, most of them are dead or civilized into useless innocence. No American wilderness that I know of is so dangerous as a city home "with all the modern improvements." One should go to the woods for safety, if for nothing else. . . .

-From OUR NATIONAL PARKS (1901).

Man's Needs and Deforestation

By JEAN DORST

The passage from a pastoral to an agricultural economy cannot be outlined simply, for numerous conflicts arose between these activities. The story of Cain and Abel, for instance, relates how the shepherd yielded to the farmer. This new form of economy involved an even greater transformation of natural habitats, particularly large-scale deforestation which is the first step in soil deterioration.

Many authors believe that agriculture began more than 5,000 years BC in the 'Fertile Crescent' of the Near East bordering the plains of Mesopotamia. It spread towards the Mediterranean basin and Europe, changing according to the nature of the environment. Each technical improvement made possible an extension of cultivated areas. Thus the invention of the iron plough opened rich, heavy soil to agriculture, which, until that time, had been confined to light soil. The enlargement of cultivated areas led to an increase in human population.

Although Mediterranean plains were doubtless never forested, the trees on the mountain slopes and hills were burned in antiquity, especially by shepherds, and irrationally exploited. The classic example is the famous cedars of Lebanon, which were chopped down to build Phoenician ships, the palaces of Achemenides and the temple in Jerusalem. 'And Solomon sent to Hiram (King of Tyre) saying . . . command thou that they cut me the cedar trees out of Lebanon . . . When he heard the words of Solomon, Hiram rejoiced greatly and said . . . I will do all thy desire concerning timber of cedar and concerning timber of cypress.' (I Kings: 5). These two sovereigns did not suspect they were ruining their kingdoms.

Central and northern Europe, which were originally heavily forested, were first ravaged during the Neolithic period, four and three thousand years BC, in an immense zone extending from Hungary and the southern part of the great German and Polish plains to Belgium. Men belonging to the Danube culture used the hoe to cultivate barley and a primitive kind of wheat, besides other plants. Their use of fire to make clearings was the first step in a progressive deforestation which was, however, restricted by the smallness of the population and by the fact that these forests, being denser and

having a greater regenerative power than those in the Mediterranean area, were transformed more slowly by man.

It would also be wrong to believe that intertropical regions remained intact until the Europeans came. A progressive destruction of original forest dates from the first settlement of farmers and shepherds in the tropics. One of the basic principles of primitive culture in these areas is the 'shifting cultivation' practised by nomads. As soils become unproductive, so people are frequently forced to move on.

At the beginning of the dry season, a man clears a sector of forest, chops down the bushes but leaves the trees. The sun dries out any remaining plants, which are then burned to ashes. The ground is planted, and crops ripen during or at the end of the next rainy season. This ground does not remain fertile for any length of time, and after one or two harvests the farmer may move to begin the same cycle elsewhere. Vegetation reappears in the deserted area in accordance with climatic conditions; at first it consists only of bushes but later there is secondary forest. When the soil regains its former fertility, a new cycle can begin. As the ground may need to lie fallow 20 or 30 years, large tracts of land are required to assure a satisfactory rotation.

This shifting cultivation was the pattern everywhere, and it is still practised by natives in many intertropical regions. As soon as populations increase, they cause serious damage to nature with their brush fires in the clearings and the open habitats of wooded and grassy savannas.

Long before he made iron tools or thought of agriculture, primitive man set fire to the vegetation so that he could circulate and hunt more easily. Dense dry forests thus evolved into the modern more or less wooded savanna, where the predominant plants are sun-loving and fire-resistant. When the modern African farmers arrived, they settled in dry forest and later in rain-forest. The use of clearings for shifting cultivation hastened regression of the forest and the creation of savannas, by cutting paths through fire resistant rain-forests. The transformation of Africa shows that primitive man could leave his mark on an entire continent long before he had powerful tools at his disposal.

In the New World the classic example of devastation by preindustrial man is the Mayan Empire. The disappearance of this civilization, one of the most highly developed in Central America, was chiefly caused by deforestation, shifting cultivation—the *milpa*—and fires that were set to transform habitats. Cities whose monuments attest their power and splendour are dead because of the imprudent cultural practices of short-sighted man.

At first man submitted to the imperatives of his natural habitat, as primitive tribes still do, but this period was relatively short. Soon he counter-attacked in a manner unique in the history of animals. In assuring his survival, he destroyed his habitat. It has sometimes been claimed that the destruction of nature really began with the expansion of the white man. His destructive economy and ravages are contrasted with the conservative methods of all races of natives, who are less harmful than Europeans because of their lack of

technical equipment. This is a serious error. Primitive, pre-industrial societies had already gravely injured a number of natural habitats, and some animals doubtless vanished during this period. The ravages were, of course, limited, but humanity already possessed the germs of self-destruction which developed dramatically during subsequent phases of its history.

-From BEFORE NATURE DIES. © Copyright 1970 by Houghton Mifflin Co. Reprinted by permission.

The Environment is Man's Home

By ARTHUR GLICKSON

It is all too easy to criticize a new landscape and to say that it is good or bad, beautiful or monotonous. . . .

In several countries the reclamation of new land is promoted enthusiastically, but when they come to evaluate the results observers are somewhat dubious about the new character of the landscape created. We have, in fact, been warned beforehand by the designers of the new land that the results of planning a completely artificial modern landscape might be aesthetically unsatisfactory and that some uniformity and even rigidity in the new landscape pattern could not be avoided if planning was rationally applied. . . . Now should we consider this as an inherent limitation of contemporary landscape development and submit to it? Or should we regard it as warning that the present planning programs and procedures are faulty?

In dealing with this question, let us realize that the cultural landscape, as distinct from parks and pleasure gardens, has never been designed with the primary aim of providing aesthetic satisfaction. . . . Although it is difficult to prove it conclusively, we may say that the visual satisfaction that the landscape imparts to its inhabitants is, in fact, as vital for a community as the satisfaction of biological and social needs. Furthermore, it may be stated as a designer's belief, that biological, social and aesthetic needs form an indivisible whole and must be satisfied as such.

The cultural landscape, then, cannot be beautified by a separate act of planning. If modern land-use planning must inevitably lead to rigidity, then it would seem that we must resign ourselves to the loss of environmental values, hoping that time will perhaps soften the harshness of the marks carved by us on the land. But then the truth could not and should not be hidden under pseudo-romantic or artificial nature elements. Nor would an emphasis on streamlined forms and vastly increased modern scales enhance the attractiveness of a rigid landscape pattern. In landscape design on a regional scale, even more than in architecture, the creative form must make sense. . . .

Observing the changes of the rural landscape in most countries, the conclusion may be drawn that modern man is not only the conqueror but also the originator of visual emptiness. The most rep-

representative phenomenon of contemporary landscape development is not the reclamation of deserts or sea bottoms but the creation of vacant landscapes where there formerly existed a wholesome human environment. During the past hundred to one hundred and fifty years our expanding technological civilization has treated much of the old land as if it were a vacuum. By systematic burning and clearing of vegetation, by levelling and rectangular subdivision, the *tabula rasa* for man's exhaustive economy was prepared. By disregarding the ecological chain of biological, topographical, climatic, hydrological and social conditions of life in the landscape, land management led finally to the creation of what the Dutch call, so significantly, "the steppe of culture." This widespread and monotonous type of landscape is characterized not only by being climatically and aesthetically unattractive but also by functional defects such as water and wind erosion, and unbalanced water cycle and declining soil fertility. This landscape constitutes, today, a waste of a much greater extent than the potentially reclaimable water-covered and desert areas.

The deterioration of the old rural landscape and the formation of an unsatisfactory environment on the new land cannot be explained just by what is called our "alienation from nature," or the artificiality of the environment created by us. . . .

The man-modified landscape is not identical with the unnatural landscape. I believe the cultural landscape is by definition always a man-modified environment. And yet, in the past, the artificial increase of its functional values for man did not reduce its biological and aesthetic values. There exists, perhaps, the quality of the purpose set by society to land development. In the case of the "steppe of culture" the land use aim is narrowly conceived as a rule, and of temporary nature. It is limited to the maximum exploitation of soil fertility within a minimum of time, and this infers a readiness to abandon the land after the exhaustion of its reserves as if it were a mine. This attitude results, finally, in the monotonous, desert-like appearance of such a landscape. But the aesthetic deficiencies often encountered in newly reclaimed and settled land may also indicate that the land-use aim was not broadly enough conceived. We can expect the creation of a satisfactory cultural landscape when men develop a comprehensive interest in land use. The fact that in the past communities realised that the land had to serve for generations as a cultivable and renewable source of life, as a permanent place of habitation, work, celebration, movement and rest, is the main cause for the sensation of environmental wholeness and aesthetic satisfaction which we experience in a preserved, traditional landscape.

Besides serving the immediate needs for food production, the three following principles should be incorporate in the planning program of the contemporary landscape.

The first principle: the cultural landscape should be planned for an optimal sustained level of soil fertility. Consideration of the needs of intensive production on the one hand, and of soil protection, vitalization of microbiological soil life and preservation of the

water cycle, on the other hand, have all to be taken into account and to be balanced with each other. . . .

The second point is the need for a balanced social life. In planning the contemporary cultural landscape, it should be taken into account that the standard of living of a modern rural population in industrialized countries must be adjusted to that of the urban population, though rural life will always represent a different kind of life. . . .

The third point to be observed is that the general increase of leisure and of demands for more first-hand experience of different environments, combined with the availability of faster and cheaper means of communication for the masses have revolutionized the mobility of the whole population of industrialized regions. This new factor is liable to cause fundamental changes in our conception of the rural landscape. Today this free, so to speak, uneconomic movement is still in its very beginnings, but it is rapidly gathering momentum. A working week of three and a half days, which may become the rule in some countries, in the near future, will turn the population into potential modern semi-nomads. Their wandering cannot and should not be restricted to the highways and the advertised, overcrowded resorts. The movement will be largely directed towards areas of functional interest and it may greatly increase the direct contact between the urban population and the cultural landscape and its inhabitants. . . .

The most suitable and enjoyable resorts are not the specialized recreational areas but the farming and fishing villages, the places of living and working. The urban and rural population should not, and in most cases cannot, be herded into separate enclosures. Multi-purpose land use programs, therefore, may offer the best solution for the emerging environmental problems of our time. They can be considered as an attempt to return to the comprehensive conception of land-use aims which serve as a basis for the creation of a liveable and enjoyable contemporary environment.

—From THE ECOLOGICAL BASIS of PLANNING.

Land For All Times

By RUSSELL A. BROWN

Actually "conservation" is a term with so broad an application that it is essential for the Sierra Club to carefully define its own particular goals and identify with its kin in the conservation movement. . . .

Preservationists, of whom John Muir was one of the clearest voices, saw a basic incompatibility in certain combinations of multiple use. They demonstrated the fragile and irreplaceable nature of such resources as wilderness forests, mountain meadows, desert, tundra and certain wildlife and plant species. They finally concluded that such natural resources must be essentially preserved—certainly from exploitation, sometimes from development and occasionally even from extensive human visitation, if they were to be retained for generations to come.

60 MAKE UP YOUR OWN MIND III

These two kinds of conservation, wise use and preservation of wildlands, are not always incompatible. They may occasionally complement each other. On a given land area, timber harvest, recreation, wildlife and livestock use, and even water use and water storage can be manipulated compatibly. But the basic qualities of wilderness require that its preservation cannot accommodate substantial utilization if the essential long-range values are to be perpetuated. And the preservationists value these scarce, diminishing, scenic, and wilderness resources too highly to accede easily to their consumption or destruction. . . .

Such a dedication is the reason for the conflicts which have arisen around mining ventures during the last decade. An examination of the motivations and objectives of the two forces involved may lead us, if not to agreement, at least to a partial understanding of the issues. It may allow us to anticipate our areas of conflict and, in so doing, make our future activities more efficient. We will not resolve our mutual problems, but will certainly eliminate a good deal of the attendant waste-spinning if we accept the hypothesis that in certain situations, *conflict is inevitable and compromise is impossible*. If the hypothesis sounds radical, revolutionary, or unreasonable, consider it in a more abstract sense. Between the hunter and the prey, between fire and water, or even between two political candidates, there are no compromises. One must emerge victorious. In such situations, conflict and controversy are the natural state of affairs; he who either gives or asks for quarter from his opponent has failed to recognize the nature of the battle. . . .

In the same way that one does not become half-pregnant or half-dead, you gentlemen of the mining industry can not be expected to operate half an open-pit mine; neither can the conservationist conceive of a partial wilderness or a compromised National Park. In these rather unique situations, we can only think of compromise after we have lost. If the creation of a large mining operation becomes a foregone conclusion in a de facto wilderness area, or if such an operation already exists, then, and only then, can the conservationist consider the methods of mitigation; only then will he seek an accommodation which will minimize the environmental impact, reduce pollution, or develop some system of restoration. If, by new legislation or by a judicial ruling on existing laws, a mining corporation is prohibited from operation, only then will that corporation seek compensation for its investment in the venture. To do otherwise would be to woo and win defeat.

Can reasonable men sit down and work out mutually acceptable agreements on what can be done? Probably not! There is no rational middle ground. Armed with such bleak prospects (assuming you buy the original premise), what useful strategy for action can we choose?

I will propose what, at first glance, and perhaps second and third, seems to be a distinctly unpleasant and unsatisfactory alternative. . . . If public reaction to a highly visible destruction of a scenic wonder is strong enough to cause passage of highly restrictive laws, will the expected return on a particular corporate investment (as

opposed to some other venture) be worth the price? If in the process of losing such a battle, such unpalatable changes occur, could the pursuit of the battle ever be justified?

The answers to these questions are not simple. The answers must include an analysis based on frequency and probability of occurrence and outcome, respectively.

We have examined why conflicts occur and where they occur. A brief look at the two opposing philosophies might be helpful to complete the picture. Is the conservationist the emotional, hysterical, rich, radical bearded Thoreau (as he has occasionally been described), bent upon opposing all mining and resource uses, wherever they occur? Is the preservationist intent on "locking up" all of the nation's resources, thereby crippling our economic system and threatening national security? I assure you that the answer is no. . . . Are the people of the mining industry evil blasters or compulsive destroyers, whose dislike for wild country and clean waters manifests itself in purposeful desecration? The answer again is no. . . . No truth or utility can be found in such stereotypes. *What is true is that there are two incompatible ethical systems involved, one economic and one aesthetic. Both are valid, but where they interact must, by their nature, conflict.* The results of these conflicts will not be decided on the basis of which is the ultimate truth, for truth is not the issue. Each conflict will be decided on the basis of the values involved and the quality of their presentation to the public.

As both wilderness and resources become more scarce, the ensuing debates will become more acerbic. The prizes will become more valuable for their rarity. What we are fighting, and I now mean we collectively, is the fact that man, as he becomes more numerous and consumes at an ever increasing rate, is depleting his resource base. We are, as we must, converting our system from a higher to a lower state of order (increasing our entropy). "In this century, the world has used up, and lost forever more natural resources than has all previous history." The inevitable result is that we must some day face the prospect of a declining standard of living. We may delay that day of reckoning, but come it must. The task that the preservationist has assumed is that of saving what little he can of our better bits of land as a sort of spiritual capital to draw upon when our material capital has been diminished. David Brower wrote of "the dawning realization that Growth without end is soon monstrous, then malignant, and finally, lethal—that an economy based upon incessant growth may well turn out, in the long run, to have been a chain-letter economy, in which we pick up the handsome early returns, and either our children or theirs find the mailbox empty, their resources expended by us."

There are no simple or easy answers to these ominous problems. The conservationist must follow the dictates of his conscience, saving what he can while it lasts; those involved in the business of obtaining and converting our resources for the uses of man must, to serve their own industry, begin to develop the technology for the recovery of those dispersed resources. The industry that is mining

today must become the more broadly defined resource provider of the future.

Preservation and consumption will conflict wherever they interact. I have spoken today, not with the hope of peace, but rather in the interest of improved understanding. Perhaps, with that improved understanding, we can, just once in a while, avoid those interactions which are and will be the focus of controversy.

—From a speech to the Northwest Mining Association, Spokane, Washington, December 5, 1970.

The Wasteland

By DR. ROBERT R. CURRY

As a geologist I view forest soils as nutrient reservoirs which take tens of thousands of years to form and which are now being lost through faulty logging practices at rates hundreds to thousands of times faster than their formation.

Specifically, my studies indicate that, on national forest lands in all areas of the United States except some of those in the Gulf Coast States, parts of western Washington, and possibly parts of Arizona and New Mexico, the Multiple-Use Sustained Yield Act is being patently and overtly violated in that yield is not and cannot be sustained beyond 1—4 cuttings, after which the soils of our national forest will be unable to support merchantable sawtimber until replenished by slow geologic weathering in 5,000 or more years.

Two major and relatively recent scientific findings argue strongly for a complete and radical realignment of this Nation's use of forest lands. Sawtimber production must be restricted to those highly productive flat lands in the Gulf States and parts of the Puget Sound lowlands where a merchantable saw-crop can be grown in as little as 40 years (as compared with as long as 400 years in parts of Idaho and Montana), and such production can be sustained through continual replenishment of soil nutrients through fertilization without concomitant erosion.

Present operations are not only absurdly expensive, ugly, and destructive; but threaten to turn areas of the States of Wyoming, California, Oregon, Washington, Idaho, Utah, Colorado, New Mexico, Arizona, the Virginias, and the Northeastern States, into permanently deforested scrub and shrub-covered arid hills, just as was done in Greece, Yugoslavia, Italy, Spain, and the Middle East by early residents of those areas.

The two scientific findings to which I refer are:

(1) That most hillslope forested lands, harvested by all but the most expensive, careful means, are physically losing their soil covers by erosion, despite all Forest Service claims to the contrary. In fact, USFS personnel have neither budget, time, training, or personnel to accurately monitor soil loss, . . .

The U.S. Geological Survey river sediment records indicate soil erosion accompanying logging over whole watersheds, of 40—1,000

times the rates of soil formation, meaning complete loss of soil cover in about 200—400 years if that alone were the cause of forest soil depletion. My data are based upon work done in California, Oregon, Montana, Idaho, and Arizona.

The second major finding is that certain cutting practices, particularly those that expose formerly shaded litter-bearing soils to sunlight, as clear-cutting and much selective cutting does, greatly increase biologic activity among the soil bacteria resulting in a chain of events ultimately resulting in sterilization of the soil by leaching it of its stored chemical nutrients, with or without erosion when this happens. No effects are visible and streams may remain clear, although the released nutrients may cause eutrophication just as if supplied from domestic sewers. But the forest cutting severs the nutrient cycle, . . .

The effects of mismanagement are already visible in the areas of low-solar input and young immature soils such as the Pacific Northwest, and the northern Rocky Mountain States where climax forests are still about 5,000 years away and yet a single clear-cutting renders climatically marginal areas incapable of supporting a second crop; and 20,000 years of slow succession must be started all over again, under less favorable climatic conditions.

Lack of prudent national planning and a critical lack of emphasis on scientific analysis and training among forest agencies is in my opinion at fault. . . .

A 4-year to 5-year national moratorium on cutting our forest lands might better afford economic incentives to establish full-scale paper recycling and waste wood use to permit the adoption of the better current portions of silviculture practices upon reopening our public and private forest lands to carefully control selective cutting.

—From Testimony before Senate Committee on Interior and Insular Affairs, April 5, 1971.

Timber for Housing

By ROBERT V. HANSBERGER

Our company is one of the largest single purchasers of Federal timber for harvest and conversion into a wide variety of forest products. We are also one of the largest producers of homes in the United States. We have, therefore, considerable first-hand experience in dealing with the problems of maintaining an adequate timber supply to meet the Nation's housing demands. The yield principles of forestry are matters of great concern to all of our employees. . . .

None of us would quarrel, I am sure, with the need to improve existing housing and expand total housing as a key factor in overcoming social inequities and serious residential deficiencies in both urban and rural America.

The simple fact of the matter is, however, we have not been doing it. It is a fact as well that we will not meet either our numerical

64 MAKE UP YOUR OWN MIND III

housing goals or our social housing goals unless we assign meaningful priorities to the utilization of available resources to meet those goals. Federal commercial timber is one of those resources. . . .

Seventy-five percent of the single family dwellings in the United States are built of wood frame and use large quantities of plywood. It is a fact that the residential construction market accounts for about 43 percent of softwood lumber consumption and 50 percent of softwood plywood consumption.

Having established the cause and effect relationship between housing starts and wood product demand, it is necessary to examine the impact of the national housing goals on both timber and wood product supply and demand.

The Housing Act of 1968 was passed in a year when total housing starts, both public and private, farm and non-farm, accumulated to 1,545,500 units, or roughly one million less than the average annual goal for the ensuing decade. The annual goal itself was nearly half a million starts above the highest year for housing starts in history, 1950, when our national lumber consumption had reached the highest point in thirty years. . . .

However, producers dependent upon Federal timber, notably in the Far West and the Rocky Mountain States, had already been experiencing difficulty in acquiring sawtimber from public lands in sufficient volume and at economic prices to enable them to sustain normal production. The prospect of a rise in housing starts responsive to the Housing Act of 1968, coupled with anticipated economic stability throughout the nation, triggered some fierce competition for the available public timber. Home builders, retailers and wholesalers clamored for stocks to meet the impending housing boom. Meanwhile, the Forest Service was unable to accelerate its timber sale program and raw material supplies tightened. This combination of events, which we hope will never occur simultaneously again, actually created artificial scarcities in the market place which caused prices for softwood lumber and plywood to rise sharply. . . .

It is clear that fulfillment of our housing needs, without regard to arbitrary numbers of units or annual increments, is going to require substantial increases in the availability of softwood sawtimber. Sixty percent of all the softwood sawtimber this nation possesses today stands on Federal lands. Much of it has attained such maturity that it may not stand there much longer as valuable growing resource. It will die and fall down or be destroyed by fire, insects and disease. This timber resource then becomes a public liability rather than an asset because it has been wasted and has not fulfilled its ultimate purpose for the people.

There are those who contend that the building material needs of the nation can be met by substitutes for wood. Our corporation builds thousands of houses every year using all materials with the purpose of creating structures which will meet both the comfort and economic requirements of the buyers. We know that for practical structural purposes there are no satisfactory substitutes for wood. And we are not alone in that view. . . .

The mere announcement that a moratorium is being considered could have adverse effects in the markets if anyone takes it

seriously. It could set off a wave of speculation in the future markets for lumber and plywood. Product users would rush to place orders before prices rise, thus creating a self-fulfilling prophecy. Producers will attempt to keep their order files to sizes they can reasonably service by quoting higher prices to discourage new orders.

In areas of the West where National Forest are virtually—and in some cases absolutely—the only source of timber and clearcutting is the principal method of harvesting, mill closures could lead to substantial unemployment. Local communities dependent upon public timber could be thrown into depression. Railroads and trucking companies would be affected. New houses, some 75 percent of which are of wood frame, would become much more expensive, if indeed the materials were available at all for their construction.

...
—From testimony before Senate Committee on Interior and Insular Affairs, April 5, 1971.

6

The City and the Good Life

(Cities! Who Needs 'Em?)

Beauty vs. Utility

Let us strike the key-note, Coketown, before pursuing our tune.

It was a town of red brick, or of brick that would have been red if the smoke and ashes had allowed it; but as matters stood it was a town of unnatural red and black like the painted face of a savage. It was a town of machinery and tall chimneys, out of which interminable serpents of smoke trailed themselves for ever and ever, and never got uncoiled. It had a black canal in it, and a river that ran purple with ill-smelling dye, and vast piles of building full of windows where there was a rattling and a trembling all day long, and where the piston of the steam-engine worked monotonously up and down like the head of an elephant in a state of melancholy madness. It contained several large streets all very like one another, and many small streets still more like one another, inhabited by people equally like one another, who all went in and out at the same hours, with the same sound upon the same pavements, to do the same work, and to whom every day was the same as yesterday and to-morrow, and every year the counterpart of the last and the next.

These attributes of Coketown were in the main inseparable from the work by which it was sustained; against them were to be set off, comforts of life which found their way all over the world, and elegancies of life which made, we will not ask how much of the fine lady, who could scarcely bear to hear the place mentioned. The rest of its features were voluntary, and they were these.

You saw nothing in Coketown but what was severely workful. If the members of a religious persuasion built a chapel there—as the members of eighteen religious persuasions had done—they made it a pious warehouse of red brick, with sometimes (but this is only in highly ornamental examples) a bell in a birdcage on the top of it. The solitary exception was the New Church; a stuccoed edifice with a square steeple over the door, terminating in four short pinnacles like florid wooden legs. All the public inscriptions in the town were painted alike, in severe characters of black and white. The jail might have been the infirmary, the infirmary might have been the jail, the town-hall might have been either, or both, or anything else, for anything that appeared to the contrary in the graces of their construction. Fact, fact, fact, everywhere in the material aspect of the town; fact, fact, fact, everywhere in the immaterial. The M'Choakumchild school was all fact, and the school of design

was all fact, and the relations between master and man were all fact, and everything was fact between the lying-in hospital and the cemetery, and what you couldn't state in figures, or show to be purchaseable in the cheapest market and saleable in the dearest, was not, and never should be, world without end, Amen.

A town so sacred to fact, and so triumphant in its assertion, of course got on well? Why no, not quite well. No? Dear me!

—From *HARD TIMES* by Charles Dickens, 1872.

The general impression left upon my mind as to the country itself is the almost total absence of that simple rural beauty which has resulted, in our own country [England] and in some other parts of Europe, from the very gradual occupation of the land as it was required to supply food for the inhabitants, together with our mild winters allowing of continuous cultivation, and the use in building of local materials adapted to the purposes required by handwork, instead of those fashioned by machinery. This slow development of agriculture and of settlement has produced almost every feature which renders our country picturesque or beautiful: the narrow winding lanes, following the contours of the ground; the ever-varying size of the enclosures, and their naturally curved boundaries; the ditch and the bank and the surmounting hedgerow, with its rows of elm, ash, or oak, giving variety and sylvan beauty to the surroundings of almost every village or hamlet, most of which go back to Saxon times; the farms or cottages built of brick or stone, or clay, or of rude but strong oak framework filled in with clay or lath and roughcast, and with thatch or tiled roofs, varying according to the natural conditions, and in all showing the slight curves and irregularities due to the materials used and the hand of the worker;—the whole, worn and colored by age and surrounded by nature's grandest adornment of self-sown trees in hedgerow or pasture, combine together to produce that charming and indescribable effect we term picturesque. And when we add to these the numerous foot-paths which enable us to escape the dust of high roads and to enjoy the glory of wild flowers which the innumerable hedgerows and moist ditches have preserved for us, the breezy downs, the gorse-clad commons and the heath-clad moors still unenclosed, we are, in some favored districts at least, still able thoroughly to enjoy all the varied aspects of beauty which our country affords us, but which are, alas! under the combined influences of capitalism and landlordism, fast disappearing.

But in America, except in a few parts of the Northeastern states, none of these favorable conditions have prevailed. Over by far the greater part of the country there has been no natural development of lanes and tracks and roads as they were needed for communication between villages and towns that had grown up in places best adapted for early settlement; but the whole country has been marked out into sections and quarter-sections (of a mile, and a quarter of a mile square), with a right of way of a certain width along each section-line to give access to every quarter-section of 160 acres, to one of which, under the homestead law, every citizen had, or was supposed to have, a right of cultivation and possession.

Hence, in all the newer states there are no roads or paths whatever beyond the limits of the townships, and the only lines of communication for foot or horsemen or vehicles of any kind are along these rectangular section-lines, often going up and down hill, over bog or stream, and almost always compelling the traveler to go a much greater distance than the form of the surface rendered necessary.

Then again, owing to the necessity for rapidly and securely fencing in these quarter-sections, and to the fact that the greater part of the states first settled were largely forest-clad, it became the custom to build rough, strong fences of split trees, which utilized the timber as it was cut and involved no expenditure of cash by the settler. Again, to avoid the labor of putting posts in the ground the fence was at first usually built of rails or logs laid zigzag on each other to the height required, so as to be self-supporting, the upper pairs only being fastened together by a spike through them, the waste of material in such a fence being compensated by the reduction of the labor, since the timber itself was often looked upon as a nuisance to be got rid of before cultivation was possible. And yet again, this fact of timber being in the way of cultivation and of no use till cut down, led to the very general clearing away of all the trees from about the house, so that it is a comparatively rare thing, except in the Eastern towns and villages, to find any old trees that have been left standing for shade or for beauty.

For these and for similar causes acting through the greater part of North America, there results a monotonous and unnatural ruggedness, a want of harmony between man and nature, the absence of all those softening effects of human labor and human occupation carried on for generation after generation in the same simple way, and in its slow and gradual utilization of natural forces allowing the renovating agency of vegetable and animal life to conceal all harshness of color or form, and clothe the whole landscape in a garment of perennial beauty.

Over the larger part of America everything is raw and bare and ugly, with the same kind of ugliness with which we also are defacing our land and destroying its rural beauty. The ugliness of new rows of cottages built to let to the poor, the ugliness of the mean streets of our towns, the ugliness of our "black countries" and our polluted streams. Both countries are creating ugliness, both are destroying beauty; but in America it is done on a larger scale and with a more hideous monotony. The more refined among the Americans see this themselves as clearly as we see it. One of them has said, "A whole huge continent has been so touched by human hands that, over a large part of its surface, it has been reduced to a state of unkempt, sordid ugliness; and it can be brought back into a state of beauty only by further touches of the same hands more intelligently applied."

—*From My Life: A Record of Events and Opinions* by Alfred Russell Wallace, 1906.

What Is a City?

By LEWIS MUMFORD

Perhaps the most gigantic fact in the whole urban transition was the displacement of population that took place over the whole planet. For this movement and resettlement was accompanied by another fact of colossal import: — the astonishing rate of population increase.

Above all, un-building took place in the urban environment. This loss of form and the loss of effective social institutions for transmitting and enlarging the social heritage can indeed be seen at their worst in the mining towns that sprang up during this period: the oil towns, the coal towns, the gold towns, the copper towns, the diamond towns, that began their existence in a "rush," like the tropismic flight of moths toward strong light, and that collapsed, again and again into empty hulks, or continued in existence as production centers without evolving for themselves any of the other attributes that make life in close communities valuable to man. To this day, these towns remain, despite precious efforts at philanthropy, among the darkest and most benighted parts of the world; their inhabitants, often cut off from physical contact with the rest of the world because of the mountainous terrain, cut off likewise by poverty and cramped desires, are even in free countries the most feudally organized part of the population: here the company town, with its mean power of exploitation and tyranny, has flourished.

As long as the idolum of the machine remained uppermost, the two processes of up-building and un-building went on together. . . .

The two main elements in the new urban complex were the factory and the slum. By themselves they constituted what was called the town: a word that describes merely the fact that more than twenty-five hundred people are gathered in an area that can be designated for postal communication with a proper name. Such urban masses could and did expand a hundred times without acquiring more than a shadow of the institutions that characterize a city in the sociological sense — that is, a place in which the social heritage is concentrated, and in which the possibilities of continuous social intercourse and interaction raise to a higher potential the activities of men.

The factory became the nucleus of the new urban organism. Every other detail of life was subordinate to it. Even the utilities, such as the water supply and the minimum of governmental buildings that were necessary to a town's existence often, if they had not been built by an earlier generation, entered belatedly: an afterthought. It was not merely art and religion that were treated by the utilitarian as mere embellishments: intelligent political administration was in the same category.

The factory usually claimed the best sites: mainly, in the cotton industry, the chemical industries, and the iron industries, the sites near a waterfront; for large quantities of water were needed now

70 MAKE UP YOUR OWN MIND III

in the processes of production, supplying the steam boilers, cooling hot surfaces, making the necessary chemical solutions and dyes. Above all, the river or canal had still another important function: it was the cheapest and most convenient dumping ground for all soluble or semi-soluble forms of waste. The transformation of the rivers into open sewers was a characteristic feat of the paleotechnic economy. Result: poisoning of the aquatic life: destruction of food: befouling of water so it was unfit to bathe in.

For generations, the members of every "progressive" urban community were forced to pay for the sordid convenience of the manufacturer, who often, it happened, consigned precious by-products to the river, for lack of the scientific knowledge or the empirical skill to use them. If the river was a liquid dumpheap, great mounds of ashes, slag, rubbish, rusty iron, and even garbage blocked the horizon with their vision of misplaced and unusable matter. The rapidity of production was in part matched by the rapidity of consumption, and before a conservative policy of scrap utilization became profitable, the formless or deteriorated end-products were cast back over the surface of the landscape. One might almost measure the "prosperity" of the paleotechnic community by the size of its scrapheaps and junk piles.

So widespread was this deterioration of environment, so hardened have people in big cities become to it in the course of a century, that even the richer classes, who can presumably afford the best, to this day often indifferently embrace the worst. By continued extensions over their backyards, some of the finest houses off Fifth Avenue are built almost back-to-back: dark, dingy quarters, fit for disciples of Midas. . . .

"Slum, semi-slum, and super-slum—to this has come the evolution of cities." These mordant words of Patrick Geddes apply inexorably to the new environment. Even the most revolutionary of contemporary critics lacked genuine standards of building and living: they had no notion how far the environment of the upper classes themselves had become impoverished. . . .

—*From The Culture of Cities*, © 1938, 1966, by Harcourt, Brace & World. Reprinted by permission.

Adaptability to the City

By DR. RENE DUBOS

The phrase "health of the environment" is not a literary convention. It has a real biological meaning, because the surface of the earth is truly a living organism. . . . Any profound disturbance in the ecological equilibrium is a threat to the maintenance of human life as we know it now. Admittedly, there are scientists who claim that it will soon be possible to alter man's genetic code so as to make it better suited to whatever conditions may arise in the future. But I do not take them seriously. Indeed I believe that any attempt

to alter the fundamental being of man is a biological absurdity as well as an ethical monstrosity.

Man has a remarkable ability to develop some form of tolerance to conditions extremely different from those under which he evolved. This has led to the belief that, through social and technological innovations, he can endlessly modify his ways of life without risk. But the facts do not justify this euphoric attitude. Modern man can adapt biologically to the technological environment only in so far as mechanisms of adaptation are potentially present in his genetic code. For this reason, we can almost take it for granted that he cannot achieve successful biological adaptation to insults with which he has had no experience in his evolutionary past, such as the shrill noises of modern equipment, the exhausts of automobiles and factories, the countless new synthetic products that get into air, water, and food.

Some recent experiences appear at first sight to provide evidence that the immense adaptability of man is much greater than I suggest. For example, people of all races have survived the horrors of modern warfare and concentration camps. The population continues to grow even amidst the appalling misery prevailing in some underprivileged urban areas. The other side of the coin, however, is that continuous exposure to biological stresses always results in biological and mental alterations that mean hardships for the future. For example, people born and raised in the industrial areas of northern Europe have survived and multiplied despite constant exposure to smogs made worse by the inclemency of the Atlantic climate. But the long-range consequence of this so-called adaptation is a very large incidence of chronic pulmonary diseases. The same trend can be recognized in this country.

Social regimentation and standardization is compatible with the survival and multiplication of biological man, but not with the quality of human life. Step-by-step, people become tolerant of worse and worse environmental conditions without realizing that the expressions of this tolerance will emerge later in the form of debilitating ailments and what is even worse, in a form of life that will retain little of true humanness.

We are naturally concerned with the unpleasant effects that the environmental crisis has for us in the here and now, but these are trivial when compared with the distant effects that it will have on the human beings who are being exposed to it throughout their development. Although I have emphasized—because of my professional specialization—the disease aspects of environmental insults, I do not believe that these are the most important. The mind is affected by environmental factors just as much as the body. Its expressions can be atrophied or distorted by the surroundings in which it develops, and by the hostile stimuli to which it has to respond.

American cities give the impression of being more crowded than Asian and European cities not because their population density is greater—it is in fact much lower—but because they expose their inhabitants to many more unwelcome stimuli. Much of the experience of crowding comes not from contacts with real human beings

but from the telephones, radios, and television sets that bring us the mechanical expressions of mankind instead of the warmth of its biological nature.

—From a paper prepared for the First National Environmental Teach-In, April 22, 1970.

The City Is Progress

By EDWARD C. BANFIELD

That we face an urban crisis of utmost seriousness has in recent years come to be part of the conventional wisdom. We are told on all sides that the cities are uninhabitable, that they must be torn down and rebuilt or new ones must be built from the ground up, that something drastic must be done — and soon — or else.

There is, however, another side to the matter. The plain fact is that the overwhelming majority of city dwellers live more comfortably and conveniently than ever before. They have more and better housing, more and better schools, more and better transportation, and so on. By any conceivable measure of material welfare the present generation of urban Americans is, on the whole, better off than any other large group of people has ever been anywhere. What is more, there is every reason to expect that the general level of comfort and convenience will continue to rise at an even more rapid rate through the foreseeable future.

When we are told that the population of the United States is rapidly becoming overwhelmingly urban, we probably suppose this to mean that most people are coming to live in the big cities. This is true in one sense but false in another. It is true that most people live closer physically and psychologically to a big city than ever before; rural occupations and a rural style of life are no longer widespread. On the other hand, the percentage of the population living in cities of 250,000 or more (there are only fifty-one of them) is about the same now as it was in 1920. . . .

A great many so-called urban problems are really conditions that we either cannot change or do not want to incur the disadvantages of changing. Consider the "problem of congestion." The presence of a great many people in one place is a cause of inconvenience, to say the least. But the advantages of having so many people in one place far outweigh these inconveniences, and we cannot possibly have the advantages without the disadvantages. To "eliminate congestion" in the city must mean eliminating the city's reason for being. Congestion in the city is a "problem" only in the sense that congestion in Times Square on New Year's Eve is one; in fact, of course, people come to the city, just as they do to Times Square, precisely *because* it is congested. If it were not congested, it would not be worth coming to.

Few problems, in the strict sense, are anywhere near as big as they seem. The amount of urban sprawl that could be eliminated

simply by better planning — that is, without the sacrifice of other ends that are also wanted, such as giving the satisfaction of owning a house and yard to many low-income people — is probably trivial as compared to the total urban sprawl (that is, to the “problem” defined simply-mindedly as “a condition that is unpleasant”).

Most of the “problems” that are generally supposed to constitute “the urban crisis” could not conceivably lead to disaster. They are — some of them — important in the sense that a bad cold is important, but they are not serious in the sense that a cancer is serious. They have to do with comfort, convenience, amenity, and business advantage, all of which are important, but they do not affect either the essential welfare of individuals or what may be called the good health of the society.

The same can be said about efforts to “beautify” the cities. That for the most part the cities are dreary and depressing if not offensively ugly may be granted: the desirability of improving their appearance, even if only a little, cannot be questioned. It is very doubtful, however, that people are dehumanized . . . by the ugliness of the city or that they would be in any sense humanized by its being made beautiful. . . . This loss is an important one (it is surely much larger than most people realize), but it cannot lead to any kind of disaster either for the individual or for the society.

Air pollution comes closer than any of these problems to threatening essential welfare, as opposed to comfort, convenience, amenity, and business advantage. Some people die early because of it and many more suffer various degrees of bad health. . . .

With regard to these problems for which solutions are at hand, we will know that a real crisis impends when we see the solutions actually being applied. The solution, that is, will be applied when — and only when — the inconvenience or other disadvantage of allowing the problem to continue unabated is judged to have become greater than that of taking the necessary measures to abate it. In other words, a bad-but-not-quite-critical problem is one that it would almost-but-not-quite pay us to do something about.

It is a good deal easier to say what matters are not serious (that is, do not affect either the essential welfare of individuals or the good health of the society) than it is to say what ones are. It is clear, however, that poverty, ignorance, and racial (and other) injustices are among the most important of the general conditions affecting the essential welfare of individuals. It is plausible, too, to suppose that these conditions have a very direct bearing upon the good health of the society. . . .

The serious problems of these places, it should be stressed, are in most instances not caused by the conditions of urban life as such and are less characteristic of the city than of small-town and farm areas. Poverty, ignorance, and racial injustice are more widespread outside the cities than inside them.

In many important respects, conditions in the large cities have been getting better. There is less poverty in the cities now than there has ever been. Housing, including that of the poor, is improving rapidly: one study predicts that substandard housing will have been eliminated by 1980. In the last decade alone the improvement

74 MAKE UP YOUR OWN MIND III

in housing has been marked. At the turn of the century only one child in fifteen went beyond elementary school; now most children finish high school. The treatment of racial and other minority groups is conspicuously better than it was. When, in 1964, a carefully drawn sample of Negroes was asked whether, in general, things were getting better or worse for Negroes in this country, approximately eight out of ten respondents said "better."

If the situation is improving, why, it may be asked, is there so much talk of an urban crisis? The answer is that the improvements in performance, great as they have been, have not kept pace with rising expectations. In other words, although things have been getting better absolutely, they have been getting worse *relative to what we think they should be*. And this is because, as a people, we seem to act on the advice of the old jingle:

*Good, better, best,
Never let it rest
Until your good is better
And your better best.*

—From THE UNHEAVENLY CITY, Chapter one; © 1968, 1970 by Edward C. Benford. Reprinted by permission of Little, Brown and Company.

How Many People?

By DR. E. T. HALL

Man has many needs, drives, or tropisms. Of these, food, sex, and affirmation are perhaps those most commonly considered. The need to lay claim to and organize territory, as well as to maintain a pattern of discrete distances from one's fellows, may prove to be just as basic.

My own interest in space as a cultural phenomenon stemmed from the observation that Americans overseas were confronted with a variety of difficulties because of cultural differences in the handling of space. . . .

Culture transcends man in both time and space; i.e., it is "supra-organic", which tends to divert attention from the fact that culture, on the individual, behavioral, objective, or manifest level, is also rooted in, or can be traced back to, biological activities. Man's cultural elaborations of his handling of space illustrate this point. However, man has so developed his use of space in any given culture, as well as the great diversity of space patterns between cultures, that it is fruitful to consider lower life forms as a means of clarifying the phylogenetic base.

. . . space needs may be as basic as the need for food. Not only does everything occur in a time-space plane (largely taken for granted), but the handling of space can be, and often is, a life and death matter for many organisms. . . .

It is difficult to pinpoint precisely at what time in the phylogenetic scale territoriality first became established; each expert seems to have his own idea about it. It appears that it is present in all of the vertebrates, in some form or another . . .

Man has elaborated his use of space to such a degree that it is difficult to determine just how space-bound he is. There are indications, however, that man, like the other vertebrates, moves within the framework of highly-patterned spatial systems.

Personal distance in man varies from culture to culture, and is cause for considerable marginally-felt discomfort, irritation, and some misunderstanding between people. People reared in cultures where the distance is shortest will be perceived as "pushy" by those with a longer personal distance. On the other hand, people with a long personal distance will be seen as cold, aloof, withdrawn or standoffish by the individual with a short personal distance, simply because they cannot be approached closely enough for him to become involved with them.

All of this would be of little consequence if it were not for the fact that studies in personal distance already indicate that space transcends simple matters of comfort and communication distortions. There is evidence that too much overlapping of personal distances over a period of time—in the absence of radical changes in the communication systems employed by an organism—can have serious pathological consequences in the physiological, social and behavioral spheres.

Calhoun's studies of rats which were experimentally brought into stress by crowding are sufficiently detailed and relevant to warrant being summarized here:

Calhoun placed selected strains of white domestic Norway rats in specially-designed pens. Each pen contained two burrows (one deep and the other shallow) with nesting boxes and provisions for food and water. Pens were arranged in sets of four in a row and connected by ramps so that the rats could communicate freely. End pens could only be entered from one direction while the central two pens could be entered from either side.

Calhoun reasoned that the population would build up in the two middle pens. He was correct. At the end of three generations there were three times as many rats in the two middle pens as in the end pens. Strongly established territoriality of older male rats in the end pens, plus conditioning of young rats to crowding during eating in the middle pens, tended to intensify crowding in the middle pens.

Pathological crowding occurred when 80 rats were taking their meals in pens that had proved adequate for 40 rats. At this point a "behavioral sink" developed.

The sink was characterized by disruption of: (a) nest building; (b) sex habits (males failed to distinguish between females and other males, between mature and immature rats, and between receptive and non-receptive females); (c) care of the young; (d) social organization (fighting among males and endemic and the population divided into rats who bit tails and those whose tails were bitten); and (e) reproduction.

In addition, there were serious physiological consequences (autopsied rats showed tumors and pathological lesions of the mammary glands, the uterus, the liver, and the adrenal cortex) and a lowered tolerance for vitamin A toxicity, loss of weight, and disruption of nursing of the young.

Calhoun ends his report with the following remark: "The development of a behavioral sink leads to . . . a state of sustained inordinate aggregation which may be called a pathological togetherness."

In 1916, four or five Sika deer were placed on James Island, a 280-acre island in Chesapeake Bay. By April, 1955, there were between 270 and 300 animals there, about one animal per acre. Food was scarce, but adequate. Then, in 1958, 161 deer carcasses were found. The following May, 90 more animals died. By 1959 the herd had been reduced to 80. During this crisis, autopsied deer showed greatly enlarged adrenals. Yet, when the herd had reached 80 individuals, the adrenals again assumed normal size. The implications of this study are that, since starvation was not a factor, and no other agent causing death could be identified, the deer died of stress from crowding.

The recent preoccupation with the long-range consequences of the "population explosion" overemphasizes the Malthusian relationship between reproduction rate and food supply. There may be less potential danger in this relationship than there is between population and the proper use of living space on this earth.

-From "Proxemics: The Study of Man's Spatial Relations" presented to the Arden House Conference on Medicine and Anthropology, November, 1961.

How Much Noise?

By MARK O. HATFIELD

Only recently has there been concern about the entire realm of urban and community noise although millions of Americans are affected each day by the repercussions of this type of noise. . . .

Indeed the din in the cities at times far exceeds the noise levels considered "safe" for an occupational situation. A noise level of 100 decibels was once recorded on the Avenue of the Americans in New York City where the Transit Authority was building the extension of the 6th Avenue subway. Construction is perhaps the most irritating source of noise to the urbanite and the problem is intensified when once we realize that there are virtually no legal controls on the amount of noise that can emanate from a construction site. In the absence of any forms of control the consequences are logical—existing knowledge for noise control is not even applied.

Noise control costs money, and it is not reasonable to ask sympathetic construction firms to invest in noise control only to let unsympathetic firms underbid them on jobs by avoiding the noise control costs. Air compressors, pneumatic drills, power saws, concrete mixers and other machines involved in the construction or demolition of buildings are permitted in some urban areas between

7 a.m. and 6 p.m., six days a week and at night with special permit. Combined with the poor soundproofing in modern apartments, the sounds of congested traffic which can reach upwards of 90 decibels, and the multitudinous other sounds of "civilized living," the city dweller is caught in the midst of a cacophonous catastrophe.

Europe and such countries as Russia and Japan have for some time had strictly enforced noise abatement laws, including zoning and construction measures and national councils like the Swiss Anti-Noise Commission which deals with the basic medical, acoustic and technical questions of road, rail and water traffic; aircraft noise, noise in industry, building construction, homes, etc; and legal questions.

The United States by contrast has few laws regarding noise abatement and even those that it has are barely enforced. For example, New York City is one of the cities that has strict noise laws against horn-blowing and even has a legal noise limit for the city of 88 decibels at 150 feet. If you have ever been to New York, I am sure that these laws will come as surprising news.

The repercussions of the noise problem have just begun to be understood and much has been done to alleviate the noise onslaught on our environment. For instance, New York City has a law requiring walls soundproof enough to reduce any airborne noise passing through by 45 decibels. Some construction companies have proved that buildings can be constructed quietly, by muffling blasting by special steel mesh blankets, welding instead of using the horrendous racket of riveting or bolting. New machines have been offered on the market which have a vast reduction in decibel rating over their old predecessors such as a new compressor which reduces the decibel level from 110 to 85 decibels and a new paving breaker that has had its sound reduced by 2/3.

New York, California, New Jersey, Minnesota, and other states have voted or have pending various legislation on noise abatement particularly in the realm of vehicular noise. Numerous local ordinances deal with specific noise problems of their area offering such things as prevention of transistor playing in public areas, zoning laws, etc. Some states have legislation which prohibits vehicles on its public highways that exceed certain established noise levels for that particular vehicle.

The real question at hand in the consideration of the noise level of our society is whether we are going to preserve the basic amenities of civilized life in the onslaught of technological advance.

As Dr. William H. Steward of the Public Health Service once stated: "Those things within man's power to control which impact upon an individual in a negative way, which infringe upon his integrity, and interrupt his pursuit of fulfillment, are hazards to the public health."

Noise can and must be controlled as a danger to the public health and economy, but above all else we must commit ourselves to the control of the noise in our society on the basis of civilized standards.

-From a speech to the Noise Abatement Council of America, October 8, 1969.

Culture for the Many

The arts are not for the privileged few — they are for the many, for the people as a whole . . . The values of the arts are universal: Everyone *can* feel the impact of cultural experiences, once his eyes and ears have been opened and his mind sensitized . . . The arts can also contribute to the quality of American life in everything from highway construction to graphic design, from urban planning to education, from communication media to environmental problems.

—Nelson Rockefeller, 1970.

The cities have traditionally been the home of the arts. Through the ages, as men freed themselves from the necessity of devoting all their time and labor to wresting a living from the soil, they gathered in communities where the pleasures of life could be cultivated — where philosophy, politics, and the arts could find expression. The great cities of Europe became in themselves works of art, and those who ruled them were at pains to see that opportunities for cultural enjoyment existed on a wide scale.

The United States has lived most of its history under the domination of ideas that tend to equate virtue with life on the land and corruption and decadence with urban existence. This is one reason we have allowed our cities to grow in ugliness, largely devoid of cultural attractions. Twentieth-century America is only now facing that fact that it is inescapably an urban civilization and that the quality of its life must ultimately depend upon what men make of their metropolitan centers. American cities are now being rebuilt on a hitherto unimagined scale. It is important that the cultural life of these cities be re-examined and that it be asked how, in the course of this rebuilding process, they may provide citizens with greater opportunities for aesthetic enjoyment.

Local support for the performing arts is a recent and limited development, particularly in comparison to assistance for the visual arts. There are instances of city contributions to symphony orchestras dating back to the years before World War II, but in most cases support has come within the past ten years. Municipal or county support for opera is found in a few cities, and support for drama and dance in fewer still. In the aggregate, however, local government aid for the arts is growing at a significant rate.

The panel believes every local government should have as an accepted goal the strengthening of local arts organizations and the broadening of their service to their community. For example, by insuring adequate facilities for performance; providing funds for operating costs; supplying supporting services; purchasing the services of the arts for schools and the community; exempting arts organizations from taxes and license fees; helping mobilize community support for the arts.

—From THE ROCKEFELLER PANEL REPORT ON THE FUTURE OF THE PERFORMING ARTS. © 1965 by The Rockefeller Brothers Fund. Reprinted by permission.

An Alternative Life Style

By HANS SACHS

Now since the world's become a waste
 By guile and treachery debased,
 We can no longer there abide
 But in the wilderness reside,
 And here our unschooled children raise
 Far from the faithless world's ways.
 Here we feed on wild fruits
 And pluck the earth's sweet-tasting roots.
 The sun bestows its warming light
 And secret springs their waters bright.
 In moss and leaves you find us dressed;
 At night on beds of grass we rest.
 Our home's a cave we freely share;
 We make all people welcome there.
 As for the wild beasts of the wood:
 We join with them in brotherhood
 And honor always, as true friends must,
 The pledge of peace and constant trust.

Thus in forest solitude
 Our children grow and bear their brood.
 In well-knit fellowship we live
 And never cause for rancor give.
 For each does to the other do
 As he would fain be done unto.
 We take no care for worldly things
 Though little, serves for plenitude—
 For which, God hear our gratitude!
 And should misfortune us befall
 We know that God yet orders all.

In just such sound and simple ways
 We humbly while away our days
 Until shall come a mighty change
 That through the world will widely range
 And bring men back to piety
 And natural simplicity.
 Then we shall leave these woods behind
 To live again among mankind.

—From *"The Lament of the Medieval Wild Men Against the Unfaithful World."* 16th Century.

7

The Economics of Pollution Control

(Pollution, the Problem For Somebody Else)

Pollution v.s. High Standard of Living

By WILLIAM B. JOHNSON

... There generally is substantial agreement among architects of our society—economists, sociologists, ecologists, scientists and politicians—on what should be done to improve the quality of life and promote the nation's welfare. But there invariably is chaos when it comes to deciding which problem should now receive the main thrust of our resources and our coordinated planning and implementation. ...

Look at our overreaction to environmental pollution, which suddenly has assumed the gravity of a full-scale national emergency. ... We have been bombarded with many wildly conflicting predictions and a great deal of emotionalism and frenzy.

As a concerned citizen and businessman, I would like to know whether the dangers of pollution have a more serious physical and psychological impact on American life than the housing shortage, which has been plaguing us for a generation. Before we embark on a giant crash program to stamp out pollution, at any cost, I'd like to know something more about that cost. For example, will a convulsive effort to correct our abuses against nature delay—or derail—the drive to correct other historic abuses perpetrated against our fellowmen. The social climate also is a vital part of our environment.

I don't mean to belabor the pollution issue, but it is a conspicuous example of the tendency of government on federal, state and local levels to react too late, and then too violently, to questions that were swept under the rug years ago. Industry suddenly has become the arch-villain in the agitation against pollution. The crusaders blithely ignore the fact that there has been a drastic and sudden change in the rules of the game. For more than a century, all that the public asked of technology was that it turn out a succession of cheap new products and services that made life a little easier and more convenient.

Since cheap, efficient consumer goods was the public's top priority, industry responded by raising the standard of living in America to unrivalled heights. Now, suddenly, critics are rejecting the benefits of mass production and are applying new criteria to the technology that makes it work. . .

A lot more will be done as soon as Washington sets up guidelines for questions that surely cannot be ducked indefinitely. But there are also the questions of who is to pay for environmental control and what it will cost the people. What is the top priority—a pollution-free environment or low cost products and services? Suppose the former makes the latter impossible—and surely we can't have it both ways. If Washington yields to popular pressures and makes industry, and thus the product users, absorb the burden of curbing pollution as a cost of doing business, we'll see an unknown degree of violence done to another facet of the environment—the daily cost of living. That may indeed be the best answer, but it should be done knowingly, if at all, and there should be no later surprise at the consequences.

The growth and stability of small businesses is a highly desirable element of the free enterprise system, but some of us have become aware that the campaign against pollution is beginning to take a heavy toll of small or marginal operations. In states where stringent pollution laws have been adopted, many small foundries that cannot afford to comply with the regulations have shut down or are for sale at a sacrifice. It is a predictable cinch that similar difficulties will cause widespread havoc in other sectors of the economy.

What about public utilities? They have been made whipping boys for air and water pollution with complete disregard for the facts. Until a few years ago, regulatory agencies were slow to approve the use of cleaner fuel and the installation of purification equipment in public utility plants. Public Service Commissions, concerned mainly with holding down rates, generally withheld the necessary permission. . . .

Permit me to pose a hypothetical situation that is not as far-fetched as it may seem. President Nixon recently called for a crash program cutting emissions of pollutants by automobiles up to 93 per cent by 1980, regardless of the cost or the effect on the performance of cars. . . . *The Wall Street Journal* carried a front-page story reporting that many top engineers in Detroit doubted that the internal combustion engine can be redesigned to meet those requirements. Other authorities declared that a cleaner engine will boost the price of cars by several hundred dollars, increase maintenance bills and add to operating costs by yielding from 10 to 16 per cent less mileage on unleaded gasoline. . . .

Let us assume, as an intellectual exercise, that General Motors is on the verge of the big breakthrough. Officials of the company meet with Congressional committees and tell them: "We can completely eliminate pollutants from cars in three years by spending \$200 million on research and development of fuel cells. We can reduce pollutants 90 per cent in five years by spending \$200 million on redesigning internal combustion engines. We can't underwrite both programs. On which one do you want us to concentrate?"

Your impulse is to select the fuel cell. It will achieve better results faster. But hold on a minute.

The giant oil industry has invested billions of dollars in equipment and installations in this country and abroad. Cutting its market in half will throw a monkey wrench into the nation's economy, perhaps

touch off another recession. What about the millions of employees and stockholders of oil companies? Oil still will be vital to the nation's defense. Should the federal government subsidize the industry to ensure ample reserves, and what will the cost be? There are 222,200 gas stations in the United States. They support two million people, counting the families of owners and attendants. What happens to them and the operators' investments, as business dwindles with the gradual disappearance of gasoline-powered vehicles? Incidentally, the 100 million cars and trucks on the roads today would not ordinarily be phased out entirely for some 10 years. Whose obligation will it be to maintain enough gas and service stations to keep them running?

The solution to the original problem seemed clear at first, but on further thought it opens up a barrel of snakes. There are so many ramifications that Congress is reluctant to choose between the internal combustion engine and the fuel cell. Is a 10 per cent reduction of air pollution below a minimum tolerable level, achieved two years sooner than it otherwise might be, worth the economic dislocation it entails? . . .

Identifying national priorities is an enormously difficult job bristling with political booby-traps, but it is a responsibility the federal government has already assumed, and I merely suggest that it be done in a more sensible way. It may sound new but I believe there is nothing heretical in asserting that a prime function of a republican form of government is to look ahead, recognize trends and practices that hold the seeds of social problems, then chart the courses that best serve the interests and ambitions of the greatest number of citizens. Businessmen have identical responsibilities to their customers, stockholders and communities. Progressive executives meet that obligation by setting up profit centers that draw upon all available scientific methods to solve their problems.

There is no earthly reason why a national priorities board cannot follow a similar procedure of analysis and evaluation, then submit its recommendation—with a minority report where appropriate—to the President. . . .

—From a speech at Town Hall, Los Angeles, California, June 2, 1970.

Pollution, A Symptom—Not a Cause

By BARRY WEISBERG

We have broken with the naïve evidence of life. We walk the streets of America asleep to the poisons which consume our body and mind. . . .

Yet we do not truly experience the war or DDT. No more than we truly experience the vast natural foundation which is our heritage. Our mind has escaped its roots in the body of this world. We are estranged from our natural roots, the air, land, water, and other animals. We are separated from one another and from the world of which we are part. . . .

The destruction of the biosphere as a suitable habitat for life as

we know it is not simply a matter of too many people or that some people consume too much of the others' share, but is rooted in the systemic imbalance between the capitalist organization of society and the life-sustaining capacity of this planet. The daily imposition of capitalism upon the functioning of the life support system exacerbates geometrically the future of biological evolution. . . .

It is foolish to focus attention upon Santa Barbara or auto emissions without at the same time examining the structure of social, political, and economic relationships responsible for these events. . . . One can no more understand events in isolation in the social context than in the natural dimension. It is the organization behind the parts, biologically and socially, which is the proper subject, ecologically and politically, of our current peril. As the relationships among organisms are the foundations of any ecosystem, in the modern political state the relationships between the entities are as important as the entities themselves. Thus the political framework for an examination of our ecological crisis is derived from the basic configurations of ecological science — the relationships between organisms and their environment. . . .

. . . Twentieth century America has altered the chemistry of the atmosphere and begun to empty the vast oceanic vat. Behind the glossy, earth-bound image of the moon lies the abandoned debris of Apollo. Women now fear to breastfeed their children because of the harmful concentrations of DDT in the milk. A fate shared by both polar bears and penguins.

The manipulation and exploitation of the life support system and the production of hazardous chemicals are today compounded by arrogance upon ignorance. This imbalance is the result of a massive system of irrationality which literally blinds its inhabitants to the experience of a decaying world. This imbalance is reflected daily by the concentrations of mercury, radiation, and the constant parade of other hazardous substances. . . .

The appetite with which America consumed the "environmental crisis" in the late 1960's is not unlike the "war on poverty" or the "war on hunger." Except in dimensions, the "war on pollution" assumes all the old familiar trappings — numerous new governmental agencies, a flurry of legislation, and public-directed attention. As with poverty and hunger, the large corporations — responsible for the inequities in income and distribution of wealth — brandished numerous programs to put an end to these social ills. Not surprisingly, the corporations grow fatter and the earth grows leaner. With the environmental campaign, publishers developed a new market overnight. Bookstores instantly acquired row after row of environmental publications, thus further consuming vast amounts of timber and associated resources. Most impressive is the pollution control business which sprung up, promising as much as 20 percent profit for pollution control technology to the same companies most responsible for environmental destruction. In short, as always, America has made out of a social crisis another commodity.

The masters of waste did not overlook any detail in the management of the new commodity. The public acceptance of the term "pollution" is itself a revealing lesson. "Pollution" properly refers

to a remediable problem, that is, a problem for which a solution is known and available. When we "pollute" something, says Webster's, we make dirty, impure, or unclean. Thus the emphasis on "cleaning up America," on litter and highway beautification in the Johnson administration. But if we are to take seriously the recent evidence, we must conclude that man now poses a fundamental and perhaps unalterable threat to the evolutionary process. Such a manipulation of the life support system challenges the very regenerative capacity of the earth. The term "pollution" here is completely inappropriate. It harkens back to an earlier, less industrialized, less productive age. It is a measure of the unwillingness to accept the situation at face value that America has chosen to label the condition as "pollution." . . .

Today, . . . we steadily approach a breaking point in the major life-giving systems — atmosphere, hydrology, nitrogen cycles, photosynthesis. As a result of continued contamination they may well surpass their tolerance level, in other words, break down altogether. The precise tolerance level is unknown. But evidence mounts daily, some presented in this book, that we are precariously close. We will never know precisely the moment at which we begin to recede, or how close we are at any moment. That is because there are as yet no clear and definitive boundaries between the balance of organic and inorganic matter. If the breakdown occurs, it will certainly be more of a whimper than a bang at first. By the time we hear the bang, it will be too late. The earth's plumbing cannot be replaced. . . .

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How Much Must Consumers Pay?

By JOHN T. CONNOR

. . . My concern is not just for my own company or even just for the chemical industry. I am concerned that, if the legislation emerges in the form of the Muskie Bill which passed the Senate by a vote of 86 to zero, considerable damage will be done to American industry, to our entire economy, to Federal, State and local government credibility, and to all taxpayers. In my view that damage will far outweigh the beneficial effects on our waterways.

. . . I strongly oppose "flying blind" in such a serious undertaking by setting up a goal of zero discharge of all pollutants into all our waterways by 1981 or 1985. And that's exactly what the Muskie Bill (S. 2770) would have us do. That bill requires us to set our course in 1972 towards that zero discharge goal and requires the Federal and state administrators to continue to drive all of us forward towards that goal as quickly as possible. . . .

. . . Unfortunately, the truth is that right now neither the public

nor the Congress is well informed on these consequences of the Muskie Bill. The Senate Public Works Committee, it is true, debated the proposals over a period of months, but the most critical decisions were made at the last minute and without public hearings. In particular, the change in the enforcement mechanism of the Federal program from water quality standards to effluent limits was adopted at the last minute without public hearings. The same thing is true of these important goals and objectives:

(1) In Phase I, to be implemented by 1976, all industrial pollution sources must apply the "best practicable technology," and communities will be required to have secondary sewage treatment construction programs by June 30, 1974.

(2) In Phase II, to be implemented by 1981, communities and industries will be required to apply, where the goal of no-discharge cannot be attained, the "best available technology."

And (3) the policy is stated that the discharge of all "pollutants" should be eliminated by 1985 and that the *natural* chemical, physical, and biological integrity of the nation's waters be restored.

How can we refuse to sympathize with the business people and the governors of our states and mayors of our municipalities who have nightmares about being required to build or alter a plant in 1974 using the "best practicable" technology and then being required in 1979 to alter it, or build a new plant at a different location, using the then "best available" technology, as defined by the government administrative people? . . .

The Muskie Bill simply promises too much. It raises hopes on which it can't possibly deliver. The bill sets forth the goal of no discharges of any pollutants into any body of water in this country by 1985, and for technological reasons, this just can't be done. The Muskie Committee report quotes an Administration estimate that a 95 to 99 per cent reduction in pollutants would require a capital expenditure of more than \$35 billion in the next 10 years and operating and maintenance costs of more than \$83 billion over a 20 to 25-year period. The Committee acknowledges that these figures may be conservative, and it notes that the Administration estimates the capital cost of achieving 100 per cent pollution control at more than \$94 billion, which undoubtedly also is too low an estimate. . . .

Of course, no one can state now with any precision what the total costs will amount to, but undoubtedly they will be high, very high. And because they will, it is vitally important that we set a different kind of goal for ourselves—not zero discharge. It is important also that we ask other questions. What is the *quality* of the water that is essential for recreational uses and to support aquatic life? What kind of limits must be set on the discharge of pollutants to achieve this quality level? Should it be 90 per cent? 95? Or, more likely, a whole range of percentages, depending on the nature of the particular pollutant, the stream into which it's being discharged and a number of other factors.

If the American people understand what is involved, they will say that they are not willing to pay in increased local, state and federal taxes, and in higher product costs, the astronomical costs of *trying* to achieve the zero discharge goal, on top of the rising government

expenditures for so many other worthy public objectives. I make those predictions flatly because I have been around to see the credibility gaps, bitterness and disillusionments that have set in among the people when other goals were announced by earlier Administrations and Congresses and which proved to be unattainable or undesirable. . . .

-From a speech before the Synthetic Organic Chemical Manufacturers Association, January 6, 1972.

The Cost of Pollution

By RON M. LINTON

Man *can* avoid a tomorrow of environmental crises. He will have to work at it, for it is easy to accept the conditions we live in as an inevitable concomitant of life. That is what we are doing now. We live with air and water pollution; we tolerate increasing annoyance from noise; with a slight murmur we suffer crowding and congestion; we hardly pay any attention to a host of other environmental abuses that can injure man mentally and physically. We learn little from our past. We do those things that are the easiest, and it is easy to ignore environmental pollution. . . . The food we eat, the water we drink, the household products which we use most often never appear to be related to problems of health or injury that occur. No one seems to be dying from an attack of the environment. Nor do most people associate any disease with it. If man doesn't like his environment, at least he lives with it. But is no one dying?

Certainly man adapts. This history has proved. He emerged in greater numbers than ever before after more than a century of being scourged by infectious diseases. The death rate used to be atrocious, but it was ascribed to the disease and not to the environmental conditions that bred the disease. . . .

What about the future? It appears now that man is creating more environmental problems for himself than he will be able to solve. But he doesn't have to. He doesn't have to adapt and die in the process.

It is clear that if we are going to be able to move politically, we are going to have to establish how much we are paying for not cleaning up our environment. We are also going to have to establish just who is making that payment. We have long taken the attitude that the air and water are free and that there is no cost to anybody in dumping wastes into either. This of course is not true. Something is used; someone is paying for that use. A manufacturer can dispose of unwanted materials at no cost to himself. But when he does, someone else has to take on the burden of paying for that disposal. Most of the cost is increased illness and discomfort, and thus a reduction in the value of the resource. . . .

There is no better example of the difficulty of establishing cost than in the case of air pollution. Air pollution can be a local problem or a wide-ranging one, depending on the course of winds. It directly

affects the physical health of human beings; it damages animals and crops. Its effect can be both chronic and acute. And, unlike water, air, once polluted, is untreatable. But the difficulty of establishing specific damage costs should not stop us from making the effort. Even if the first estimates lack something in their accuracy, a start has to be made someplace. As the estimates are made, more and more efforts will be undertaken to refine them, and ultimately our cost assessments will become more and more acceptable. Somehow we have got to determine what it will cost in dollars for society to continue contamination of the environment as population and production rise. To determine who is getting the benefit of using the environment as a waste receptacle will be equally as important as determining who is paying the cost for such use. As we make progress in both these areas, which public policies must be adapted will become more evident.

For example, it will be clear that it will be less costly to prevent pollution than to clean it up after it occurs. It will be clear that it will be less costly to re-use wastes than to dispose of them. . . .

No one is now doing any extensive calculations of the costs of environmental deterioration. No one is now making any serious assessment of social distress caused by environmental pollution. . . . The efforts of government at every level have been too fragmented and have come too late; the efforts of industry have been limited.

The failure to recognize the costs in human resources of polluting the environment, combined with the inadequacies of government and reluctance of industry to come to grips with environmental degradation, portend not a very optimistic view of the future, and will not brighten until the public understands that government must be able to foresee the effects of environmental pollution in order to be able to forestall them.

To foresee such effects the government must be able to assess the economic consequences of pollution, for which it must have the proper resources and capabilities.

The present level of government spending in the pollution control area is a joke. The Air Pollution Control Administration spends about \$80 million a year. The Environmental Control Administration of the Department of HEW, spends about \$65 million a year to control rats and noise, to improve water-supply quality, manage waste disposal and eliminate occupational illness and injury and radiological illness. The Food and Drug Administration has about \$90 million a year to protect 200 million Americans from illness and death from contaminated foods and dangerous drugs. The economic losses to the nation from air pollution are in the billions and all the agencies of the federal government combined spend less than one billion dollars a year on environmental protection.

America's sense of priorities is wrong. Tax dollars are not being spent the way they should be.

But tax dollars, as necessary as they are, alone will not solve the problem of environmental pollution. Dollars must support programs that produce knowledge which can be used to avoid pollution and correct what has occurred. Dollars must be supported by programs

that will set standards of environmental quality and then enforce those standards.

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Inflation and Water Pollution

By RICHARD M. NIXON

To the Senate of the United States:

The pollution of our rivers, lakes and streams degrades the quality of American life. Cleaning up the Nation's waterways is a matter of urgent concern to me, as evidenced by the nearly tenfold increase in my budget for this purpose during the past four years.

I am also concerned, however, that we attack pollution in a way that does not ignore other very real threats to the quality of life, such as spiraling prices and increasingly onerous taxes. Legislation which would continue our efforts to raise water quality, but which would do so through extreme and needless overspending, does not serve the public interest. There is a much better way to get this job done.

For this reason, I am compelled to withhold my approval from S. 2770, the Federal Water Pollution Control Act Amendments of 1972—a bill whose laudable intent is outweighed by its unconscionable \$24 billion price tag. My proposed legislation, as reflected in my budget, provided sufficient funds to fulfill that same intent in a fiscally responsible manner. Unfortunately the Congress ignored our other vital national concerns and broke the budget with this legislation.

Environmental protection has been one of my highest priorities as President. The record speaks for itself. With the Council on Environmental Quality and the Environmental Protection Agency, we have established a strong new framework for developing and administering forceful programs in this problem area.

The budget authority which I have requested for pollution control and abatement in fiscal year 1973 is more than four times the amount requested in 1969. Federal grants for local sewage treatment plant construction have increased almost tenfold, from an annual rate of \$214 million appropriated up to the time I took office, to \$2 billion in my budget for 1973. This dramatic growth in the share of Federal Government resources being devoted to the environment exceeds, many times over, the rate of increase for funds in most other major government programs.

Every environmental spending increase that I have proposed, however, has been within the strict discipline of a responsible fiscal policy—a policy which recognizes as the highest national priority the need to protect the working men and women of America against tax increases and renewed inflation. Specifically, the water pollution

control bill which I originally sent to the Congress last year was fully consistent with the concept of a balanced, full-employment budget. It would have committed \$6 billion in Federal funds over a three-year period, enough to continue and accelerate the momentum toward that high standard of cleanliness which all of us want in America's waters.

By contrast, the bill which has now come to my desk would provide for the commitment of a staggering, budget-wrecking \$24 billion. Every extra dollar which S. 2770 contemplates spending beyond the level of my budget proposals would exact a price from the consumer in the form of inflated living costs, or from the taxpayer in the form of a new Federal tax bite, or both.

If this veto is not sustained, however, let the issue be clearly drawn. As with the spending ceiling, so with this bill, a vote to sustain the veto is a vote against a tax increase. A vote to override the veto is a vote to increase the likelihood of higher taxes.

Even if this bill is jammed into law over the better judgment of the Executive—even if the Congress defaults its obligation to the taxpayers—I shall not default mine. Certain provisions of S. 2770 confer a measure of spending discretion and flexibility upon the President, and if forced to administer this legislation I mean to use those provisions to put the brakes on budget-wrecking expenditures as much as possible.

—From Veto Message, October 7, 1972.

Consequences of Pollution Control

By M. V. ANTHONY

Industry is just one source of pollution. Taking air pollution as an example, a National Academy of Sciences report states that *transportation* is responsible for 59.9 per cent of the air pollution in this country; *generation of electricity* for 12.5 per cent; *space heating* for 6.3 per cent; *refuse disposal* for 2.6 per cent and *all manufacturing* for 18.7 per cent. If these figures are correct, and I have no reason to doubt them, the electric power companies and all manufacturing plants (not just chemical plants, mind you) could reduce their atmospheric emissions to zero and only about 1/3 of the problem would be solved.

But let's stick to industry's own pollution problems. Many industrial pollution problems *do* remain—problems which can and must be solved to meet the increasingly stringent public demands for a cleaner and more healthful environment. Fortunately, technology is available at the present time to reduce man-made pollution to most any level desired *if* the public is willing to pay the price. We must never forget, however, that in the final analysis, it is the public that pays the price.

For under our present economic system, the manufacturer must pass his production costs along to his customers if he is to stay in business.

An industry that spends money for pollution controls over and above those dictated by common sense to protect people's health and property robs itself of money that could be used to increase wages or to construct new facilities that would create more jobs. The community which suffers an inflated cost of living because of unrealistic and unreasonable pollution control measures has less money available for schools, sewage plants and other social needs.

I do not wish to leave the impression that I favor society's tolerating unsightly clouds of smoke, nauseating odors, suffocating clouds of particulate matter or polluted streams. We *all* want a better, more pleasant environment in which to work and play. However, I do say that after people's health and property are reasonably and properly protected, that cost-benefit factors should be taken into consideration. We should not be lead down the primrose path of requiring controls on every pollutant to the maximum extent that is technologically possible when this would involve society's paying an unnecessary and possibly exorbitant cost.

Idealistic legislation based on emotionalism does not give maximum benefits to the community as a whole. In fact, we may do ourselves a disservice.

The present agitation to outlaw the insecticide DDT may be a case in point. Most of us are bird lovers, and we love to fish. When we hear that DDT and similar insecticides are threatening the bird and fish populations, we tend to accept the statements as fact and are receptive for drastic action. You may be as surprised as I was to learn of evidence which contradicts some of the common tales told about the evil effects of the highly poisonous pesticides, for example, that DDT from agricultural use is poisoning our streams. DDT, its metabolites and dieldrin, are highly insoluble in water, something like one part per million or less, but millions of times more soluble in waxes and fats. The surface on every tree leaf and every blade of grass is covered with little tubes or plates of wax, often like shingles on a roof. Within hours much of the DDT is in solution in this epicuticular wax. It then resists washing off. Studies in Southern Mississippi, when DDT was incorporated in high concentrations (2300 ppm) in soil for termite control, indicated the pesticide moved very slightly in two decades of weathering in an open field. Most of the DDT appears to be reaching the streams from city sewers. It originates from the outer portion of fruits and vegetables, from insecticides dumped down the sewer by mothproofing establishments and others and from human excrement. The significant fact is that the urban community need not sacrifice its use of these chemical pesticides to avoid significant contamination of streams, rivers, lakes and estuaries. Sanitary engineers indicate it is possible to almost completely remove DDT dieldrin and certain other pesticides through treatment of urban effluents. This indicates that our prime concern should be directed toward treating sanitary wastes, the acknowledged #1 polluter of public waters, and the DDT residue problem in public water will automatically disappear.

There is considerable doubt, too, as to the adverse effect upon birds by the chlorinated hydrocarbon insecticides. These materials have been used *intensively* for a 20-year period. It is said that the

herring gull along the northeastern coast continues a veritable population explosion in the fact of abnormally high body residues of chlorinated hydrocarbons. The robin, despite oft-recorded mortality from urban pesticide programs to protect shade trees, still finds overall habitat conducive to a population increase.

We hear of birds becoming extinct because of the greater use of insecticides; yet a U.S. Dept. of Interior Committee on Rare and Endangered Wildlife Species in 1966 listed 50 species of birds that are in trouble. In discussing the factors responsible for the decline of specific birds, pesticides are mentioned only twice, and even then only as a "possibility" following discussion of known factors.

I believe you will agree there may be enough evidence in defense of pesticides to warrant a *real questioning attitude* when idealistic controls are proposed making unlawful the use of materials with proven value in mankind's ceaseless effort to control famine and disease.

Environmental contaminants, while an inescapable by-product of civilization, are now recognized as a problem that must be watched *continually* and kept under control.

Industry has committed to the battle large sums of money as well as the talents of some of its most capable scientists and engineers. Industry is *indeed* concerned and stands ready to work with all interested parties in developing programs that are *technically sound* and *economically feasible*. We will do our part in helping society reach for the *common* objective of a high standard of living and a healthy environment.

—From a speech before 3rd Annual Symposium on Environmental Contamination, Lincoln, Nebraska, February 1, 1969.

The Economics of Recycling Waste Materials

By M. J. MIGHDOLL

Our association represents a wide range of business firms which share one common economic purpose and interest: the recycling of solid waste materials into new raw materials and products. Our members—over 700 corporations located throughout the country—and the industries they comprise relate to practically every major commodity element of the economy and to a diverse range of operational activities. They are concerned with the collection, recovery, processing, refining, converting, and manufacturing of all metals, paper, textiles, rubber, plastics, and other materials and products.

The vital relationship that recycling of materials has to the economic, environmental, and conservation well-being of the country can only underscore the urgency of establishing a favorable national climate under which the recycling concept can attain the economic viability that is essential to its expansion.

In some cases, recycled materials are actually losing their previously established portion of the market. This is well illustrated

by the situation in the paper industry, where new production records have been set during the past decade. Yet, in spite of that, we are using proportionately less recycled paper. We declined from a 35 percent recycling rate in the mid-1940's to almost half that rate in the late 1960's. This is most significant in view of the fact that paper constitutes one-half of this country's municipal solid waste.

We are in a packaging-oriented society that has developed a paperboard industry of record proportions, but has permitted the use of recycled materials by that industry to sink from a 42 percent raw material furnish factor to a 28 percent level in just 10 years.

The fact is, however, that far from having a favorable economic climate, far from having policies to encourage the utilization of recycled materials, we have Federal policies and national philosophies which serve as economic obstacles to the use of these valuable and needed materials. Present industrial habits, government policies, public apathy, prejudicial and discriminatory regulations put the Nation on a path of virgin material preference and direct it away from economically viable recycling. Permit me to quickly examine several of these economic restraints to recycling and to focus on the most critical situations which deserve urgent attention and action by the Congress.

Through the years the Congress established tax policies designed to encourage the development of our natural resources. In a different era, with different needs and objectives for the Nation, certain tax policies were evolved which have had the effect of providing economic advantages for the marketing of primary or virgin materials.

Depletion allowances for virgin metals and capital gains tax treatment—as opposed to higher ordinary tax rates—for profits derived from the utilization of trees in the paper industry simply made it economically disadvantageous for many manufacturers to use recycled materials.

Since recycled materials must compete directly with comparable virgin materials, the net result of current tax policies is to provide economic encouragement to the continued and expanded use of domestic ores and virgin woodpulp, to the direct economic disadvantage of recycled materials. . . .

A significant cost factor in the recovery and utilization of recycled materials is that related to transporting the material to its natural and most economical market. Through past years, the transportation rates established by the Nation's railroads and steamship companies have discriminated against recycled materials as compared to their virgin counterparts.

The net result is a distinct ton-per-mile advantage for virgin commodities. Furthermore, most recycled materials move longer distances to their points of consumption. For instance, in the eastern part of the United States, pulp wood is transported from forest to mill on the average of 136 miles, whereas wastepaper averages a distance of 434 miles from recovery point to consumption point.

In short, transportation rates and policies have not been adequately related to the recycling objectives that have been pro-

nounced by the Federal Government as essential to the economic and environmental goals of the Nation.

Opportunities for the creation of such new policies and for the elimination of existing rate discrimination now clearly exists as the railroad and maritime industries seek more Federal subsidies and billions of dollars in new support programs from the Congress.

The Federal Government represents one of the largest single sellers of waste materials to the various segments of the recycling industry. Yet, Federal procurement policies and specifications have tended to discriminate against products utilizing recycled materials in favor of those manufactured with virgin materials. At best, the Government procurement policies have failed to provide any incentive factor relating the desire to recover and utilize solid waste materials with the market applications of these materials as a part of product procurement.

The American consumer little understands the economic significance of recycling or its relationship to the solid waste problem. However, with each passing day the American taxpayer is increasingly burdened with costs directly related to our inability to expand recycling and reduce solid waste pollution. Many municipalities and States are considering the imposition of punitive taxes or restrictive regulations in their attempt to either minimize solid waste accumulation or to direct consumer purchasing toward recycled or recyclable material products. Chaotic conditions are now an imminent possibility, largely because of the absence of a strong Federal commitment to a positive program.

In summary, we find that far from having any specific incentive or broadbased encouragement for the expansion of recycling, the Nation has condoned economic policies which amount to a disincentive factor and which restrain recycled materials from fulfilling their potential as an economic, conservation and environmental force.

-From Testimony before U.S. Senate Joint Economic Committee, November 8, 1971.

8

Consumer Needs and Human Welfare

(The Consumer, Victim or Villain?)

Health and The Science of Ecology

By DR. RENE DUBOS

... hardly anything is known concerning the natural history of the diseases characteristic of modern civilization—let alone concerning methods for their treatment. It is urgent therefore to develop a new science of human ecology focused on the conditions prevailing in the technological environment.

One can take it for granted that medical science will continue to develop useful techniques for treating cancers, vascular diseases, and other degenerative disorders; methods for organ transplants and for the use of artificial prostheses will certainly be improved during the forthcoming decades. But most of the conditions that will thus be treated need not have occurred in the first place. Greater knowledge of the environmental determinants of disease would certainly constitute the most important factor in helping biomedical sciences to improve human health. Prevention is always better than cure, and also much less expensive.

... Air pollution provides tragic evidence of the fact that many of the physiological, mental, and social processes which make it possible to live in a hostile environment commonly express themselves at a later date in overt disease and in economic loss.

Unfortunately, adaptation to the stresses of the present often has to be paid in the form of physiological misery at some future date. Even among persons who seem to be unaware of the smogs surrounding them, the respiratory tract registers the insult of the various air pollutants. Eventually, the cumulative effects of irritation result in chronic bronchitis and other forms of irreversible pulmonary disease. Generally, however, this does not happen until several years later.

Chronic pulmonary disease now constitutes the greatest single medical problem in northern Europe, as well as the most costly. It is increasing in prevalence at an alarming rate also in North America and it will undoubtedly spread to all areas undergoing industrialization. There is good evidence, furthermore, that air pollution contributes to the incidence of various cancers—not only pulmonary carcinoma. It also increases the number of fatalities among

persons suffering from vascular disorders. The delayed effects of air pollutants thus constitute a model for the kind of medical problems likely to arise in the future from the various forms of environmental pollution.

From the point of view of the general biologist, an environment is suitable if it enables the species to reproduce itself and increase its population; but this concept is not applicable to man. An environment allowing man to produce a family and to be economically effective during his adult years should be regarded as unacceptable if it generates disease later in life. This of course is the case for many modern technological and urban environments, which rarely destroy human life but frequently spoil its later years.

Human ecology thus differs from orthodox biomedical sciences in the much greater emphasis that it should put on the indirect and delayed effects of environmental forces, even when these do not appear to cause significant damage at the time of exposure.

Needless to say, there does exist now a definite body of knowledge concerning man's interplay with his environment. But it is a highly episodic kind of knowledge, derived from attempts to solve a few practical problems. For example, research in human ecology has been stimulated by the training of combat forces for operation in the tropics or in the Arctic, by preparation for space travel, or by concern with brainwashing and the effects of solitary confinement. Useful as it is, the knowledge thus obtained is piecemeal and does not go far toward creating a systematic science of man in his environment.

... In my opinion, this science will develop only if society recognizes that ecological knowledge is essential to its welfare, and if facilities for the procurement of this knowledge are provided either outside the university complex, or in new academic institutions not yet committed to the orthodox fields of science.

—From "THE CRISIS OF MAN AND HIS ENVIRONMENT" presented at the Symposium on Human Ecology, Warrington, Virginia, 1968.

Consumer Food Choices

By DR. LEON P. ULLENSVANG

Can you picture your life as it was ten years ago today? Can you remember what you ate, . . . ?

It is almost certain that . . .

- You had not yet tasted turkey in a roll, freeze dried coffee, instant potatoes, liquid diet food or a flavorful diet soft drink.
- You had yet to taste and really like imitation cream for coffee or imitation frozen pre-whipped cream that tastes as good if not better than the real thing.
- On that day, you probably had not yet used sugar substitutes, opened a can with your finger and a pull ring;
- or eaten food fried in a greaseless, teflon pan; frozen vegetables

cooked in a plastic bag or frozen waffles that popped out of a toaster.

In fact, of the 32,000 different products on grocers' shelves today, an estimated half of them were non-existent ten years ago. . . .

An important stimulant to our changing living styles is the mass media which carry the message of what is possible in contemporary living. We are truly in a visual and sensory revolution. . . .

But, this isn't only the effect of television, it is the increased mobility of the car and the plane, movies, stereo, high fi, color television, special interest magazines. All of these experiences are part of the affluent life. Further people are simply meeting more people in this crowded mobile, fast moving world. All of this forms a powerful basis for perceiving and accepting change.

While many aspects of our society become more standardized and uniform, there is a growing search for variety as a means of self-expression. This is manifested in food patterns. The housewife wants an easy, dependable, convenience cake mix but she still wants to do her own "thing" so she hunts for ways to make it her own by adding nuts, cream cheese, fruits, etc. Combining several convenience food gives her a dish of her own.

Technology developments are also having a tremendous impact. From the space programs, we are getting new forms of concentrated or synthetic foods. Developments in plastics and metals make packaging developments such as boil-in-bags and pop top cans possible and set new standards for convenience. Improvements in storage and refrigeration techniques; lower cost, faster air transportation all mean better quality fruits and fresh vegetables year round. Pre-cooked frozen foods, warmed for serving in micro wave ovens all make it possible to serve more people, faster in public eating.

These technical developments are too diverse and numerous to list them all here. However, there is one aspect of this technological age common to all these developments. As we put men on the moon, eliminate disease, mine minerals from the ocean, transmit sight and sound by satellite, we are developing new standards of expectations with the consumers. This has a profound effect on what consumers will accept in the way of quality and performance and how quickly they will adopt innovations in the products and services they buy.

Those of us who are "yesterday's generation" can compare today's convenience foods, new products, automatic kitchen appliances and other drudgery eliminators with their counterparts of yesterday and fully appreciate the remarkable advances that have been made. But, what of the present, younger generation and the next and the next? To them, today's products are only conventional, not remarkable. They will measure drudgery by a different standard and to them today's facilities may represent drudgery.

Thus, our society is changing rapidly. All of these currents in our society are affecting our food consumption patterns.

With this background, let's consider the more significant trends in meal patterns, the when and where of food consumption. In recent years, the number of meals served at home has not changed. However, changes have occurred in relation to the occasion at which these servings took place. Snack occasions and meals away

from home are increasing, while midday and evening meals are declining. Many of these changes are influenced by the amount of time we are spending at home and away from home.

Synthetic or formulated versions of natural food products continue to expand and gain acceptance. Activity has been most visible in the dairy area but is likely to spread to other foods. One of the most significant new product developments in synthetic dairy products was the introduction several years ago of coffee whiteners, dry and frozen. More recently, prewhipped, frozen, vegetable based toppings have received outstanding acceptance. The synthetic dairy product trend is now spreading to other specialty product areas such as imitation sour cream and cream cheese dishes.

Acceptance has been gained for synthetic or formulated foods in other areas such as fruit drinks, bacon bits, snack bars and sweeteners. Basic grain doughs are being fabricated and extruded to achieve new shapes and flavors of salty snack products. Recent examples include fabricated onion rings or snack chips made from popcorn. A new item being tested is a completely reconstituted fabricated potato chip made from a potato dough and formed into uniform size and shape and sold in a canister-like package.

The advantages of uniformity, lower costs, greater dependability and new levels of convenience in storage, preparation and use will be factors enabling new synthesized or formulated versions of natural products to gain acceptance and displace their natural counterparts.

-From a speech at the 1st Annual Agribusiness Conference, November 3-7, 1969.

Organic Foods and Health

By ROBERT RODALE

. . . I predict that food and nutrition — and the whole idea of living naturally and organically — are soon going to become as basic as reading, writing and arithmetic in the curricula of schools. They will have to become that basic, in fact, if the human race is to stay strong, healthy and thriving, in the face of increasing inroads of "civilization diseases," with their fantastic cost for medical care. Every school and college (and maybe even medical schools) will soon schedule food and nutrition studies as automatically as they now serve up traditional studies. And people of all ages will sign up to take courses that will once and for all expose the mysteries of vitamins, minerals, enzymes, and nutrients of all kinds.

. . . We can now see ahead to the promised land, where people know enough about food to select a diet that is truly beneficial. I am sure that there will soon be a nutritionally educated segment of the population that will be a powerful force for improvement of food offered for sale, because they will know how to select what is good based on a true understanding of nutritional principles.

To understand why Americans are about to escape from nutrition ignorance, you should know how we got there in the first place.

Here are the main reasons, as I see them:

1. For political and "national pride" reasons, we were for many years fed the shallow concept that "America is the best-fed nation on earth." The trappings of affluence and bulging supermarkets were confused with true nutritional adequacy. People were overfed but undernourished, and only the so-called food faddists realized that.

2. Nutrition teachers were for a long time the captives of the food industry. (Unfortunately many still are, but the number of independent teachers is growing rapidly.) The big money in food is made by processing and manipulating it, which also usually reduces its nutritional value. Those profits were used in subtle ways to capture the loyalties of home economists, nutritionists, and health educators, whose minds were closed to any but the food industry party line on nutrition. While the nation's nutritional standard was going down, the nutrition profession was going down with it.

3. Criticism of bad food was brushed off effectively as "faddism." Much of the energy of nutrition teachers was devoted to cracking down on their critics, who they called quacks, distracting the public's attention from their own brand of false teaching.

Wrong education and bad nutrition leadership wasn't the only reason why national eating habits sank so low. Pockets of poverty caused some people to suffer from borderline starvation. And the sheer technological power of man to manipulate food brought us too far away from natural goodness, without any compensating philosophy of eating that could be understood by the mass of people.

We were truly in a wilderness, but those days are ending. Why? Because of the ecology movement, mainly. Suddenly people woke up to the almost deadly worsening of environmental quality. First, the air and water claimed most attention. Then people began to realize that food was the greatest environmental exposure of all.

The revolution in nutrition education that I am talking about has itself been spawned by the ecology movement, in a very direct way. The teaching of ecology is now almost mandatory in all schools, even kindergartens. What used to be nature study is now environmental education, and what better way to teach people about the environment than to discuss their own personal ecology, using food as an example? By that route, the study of nutrition is being taken from the exclusive hands of the old-line home economists and is being packaged and sold by teachers who are exactly in tune with people's concerns of the day.

-From "Soon Even You Will Learn Nutrition in School" in PREVENTION MAGAZINE, © September, 1972. Reprinted by permission.

Cars and Mobility

By ALLAN T. DEMAREE

As a blessing, the automobile is far from unalloyed. In many U.S. cities, motor vehicles contribute as much as 75 percent of the noise and 80 percent of the air pollution. They voraciously consume great quantities of land for parking and highways, breaking up neighborhoods, uprooting residents, and displacing businesses. They clog downtown streets and freeways until, as one British observer put it, "buildings seem to rise from a plinth of cars." They browbeat pedestrians and jangle nerves. They abet that homely, unplanned urban growth called sprawl, which some fear will permanently turn America into an endless string of Tastee Freezes. . . .

Many Americans are familiar with—even support—these indictments. Yet individually they cling devotedly to their cars, cherishing the independence and convenience that comes from owning their own wheels. And therein lies a dilemma that threatens to become far more painful. For the great factories in Detroit are adding to the car supply at a rate of 22,000 a day, and the men who make cars confidently predict that production will climb to 41,000 a day by the end of the decade—the greatest ten-year increase in history. . . .

The impact of the growing flood of cars will be felt most keenly in America's bustling cities. By the end of this decade, metropolitan traffic volumes are projected to increase roughly 40 percent in Pittsburgh, 50 percent in Boston, 90 percent in Detroit, and 100 percent in Los Angeles. In the manufacturers' home city of Detroit, planners predict that traffic will be moving slower and slower in the future, despite regional expenditures of \$3 billion for new highways and arterial roads, and \$1.1 billion for a rail rapid-transit system. "If you're going to drive," says a Detroit planner, "you'd better do it before 1975."

Resentment against the omnipotent car is growing. Methods of subduing the machine are being diligently sought, in the disorganized and seemingly uncoordinated ways Americans make progress. Many proposals are quite modest, such as better control of traffic flows or encouragement for commuters to use new mass-transit services. Others are visionary, like building automated highways to guide cars through congested areas in great volumes at high speeds. Still others seek better to plan the community's physical layout—where people live, work, and play—so that travel demands can be anticipated and systematically met. . . .

One obvious way for a city to defend itself is to fight off new highways. A series of freeway revolts began in 1959 when San Franciscans rebelled at the ugly intrusion of the double-decked Embarcadero Freeway and forced the road builders to discontinue it, leaving the highway literally suspended in midair. . . . Revolts have followed in Baltimore, in Washington, D.C., Indianapolis, Cleveland, Philadelphia, New York, and elsewhere. . . .

But there is a price to pay for such blocking tactics. The traffic

keeps coming on relentlessly, and in the absence of freeways to handle it, the jams worsen.

The root cause of all the trouble remains untouched. Few possessions have become so intricately entwined in the fabric of American life as the car. The same car that has proved awkward and ill-mannered in the city made possible the single most important movement in postwar living, the massive migration to the suburbs. And, for those who can afford it, the car serves suburban living well. It frees the driver from reliance on fixed schedules, from waiting for buses or trains in cold or rainy weather, from lugging packages in crowded, uncomfortable public conveyances, and from annoying transfers from one form of travel to another.

America's fierce allegiance to the automobile was strikingly revealed by two nationwide surveys in 1967 that posed this question: "The auto pollutes air, creates traffic, demolishes property, and kills people. Is the contribution the auto makes to our way of life worth this?" Four out of five respondents answered yes, even in metropolitan areas where the adverse impact of the auto is greatest.

The decline of public transit is yet another gauge of consumer preference for the car. . . .

If one failure stands out above all others in leading us to our present state of affairs, it is that we haven't paid adequate attention to what might be called the "demand side" of the transportation equation. The physical arrangement of where people live, work, and play has a momentous impact on their demands for travel. . . .

Far more attention has been focused on the "supply side" of the transportation equation. Almost universally, large cities feel the need to provide more mass transit, even in the face of transit's historic decline and the heavy financial burdens that transit imposes. . . . the movement is beset with confusion and turmoil.

The goals cities hope to achieve are so multitudinous—and even conflicting—that they are frequently confused by city leaders and misunderstood by the electorate. The administrators seek to enhance the mobility of the poor, to revitalize downtown as a retailing center, to decongest access routes to the central business districts, airports, and other centers of activity, to reduce the amount of land consumed by highways and parking, as well as to cut down air pollution. Implicit in these goals is the need for difficult value judgments. . . .

Choices necessarily discriminate among different classes of citizens. A system that best serves commuters from the suburbs may prove seriously deficient in meeting the needs of the central-city poor. . . .

Equally perplexing is the fact that transit systems must be hand-tailored to the communities they serve. Consider, for example, the problem of carrying commuters into the central cities of Boston, Milwaukee, and Houston. Practically the only thing the three cities have in common is that they all face the threat of growing congestion unless mass transit is provided to complement the automobile.

Even with the most vigorous expansion of public transit imaginable, the number of automobiles operating over conventional roads is expected to keep right on climbing. Transit systems may

alleviate rush-hour congestion, but they will not substantially lower the over-all demand for auto travel. . . .

With staggering growth in traffic volumes expected from coast to coast, many cities will be finding it necessary to find innovative approaches, which accommodate travel without degrading the environment. The search may some day resolve the conflict of interest between car and city.

-From *"Cars and Cities On A Collision Course"* in FORTUNE MAGAZINE © February, 1970. Reprinted by permission.

Health and Auto Pollution

By P. B. HAMMOND AND SAMUEL LENHER

This essay is about one of the most notorious poisons known to man. Down through the years, there has been more written about clinical lead poisoning in man and domesticated animals than about poisoning by any other agent. The magnitude of the problem of lead poisoning in occupational settings led to much of the early industrial hygiene legislation and to a great deal of toxicological research. Yet here we stand today still worrying about it. The "new dimension" alluded to in the title is one of general environmental pollution. Actually, concern with the consequences of exposure of the general population to lead is new only in the historical perspective as applies to lead. . . .

Since we have a broad acquaintance with the toxic properties of lead at all levels of human and animal exposure, the experience may prove of value to those confronted with similar problems involving other toxicants.

The toxic properties of lead were recognized as far back as the second century B.C. when Nicander described classical signs of poisoning among men mining and refining lead. Dioscorides, who lived in the first century A.D., also recognized the significance of lead as an occupational poison. Yet, effective control measures in industry were not widely instituted in the United States and Western Europe until the present century. Although a lack of concern for the lot of the working man was a strong factor, poor dissemination of existing knowledge was no doubt also involved.

The widespread early use of lead by man is readily understood in light of its many desirable properties. Lead is relatively easily refined from natural ores. . . .

It is abundantly clear that the common forms of lead poisoning result from the mining, processing and commercial dissemination of lead. Lead in its native state has never been the source of poisoning. This is in contrast to certain other metals which have caused loss of life without the influence of man being involved in any direct fashion. The outstanding examples which come to mind are copper and selenium, both of which are accumulated by some plants from virgin soils to a degree fatal to grazing livestock.

The amount of lead produced annually in the United States is

more than one million tons. Over the past fifteen years there has been little change in total annual consumption, but the pattern of use has changed. The use of metal products made of lead has declined, as has the use of lead pigments. These declining categories have been replaced by two items which reflect the rapidly expanding use of the automobile: storage batteries and tetraethyl lead (TEL), which is used as an antiknock fuel additive. TEL represented roughly 20% of U.S. lead consumption in 1966. Its contribution to environmental contamination is actually even greater than would be suggested by consumption figures.

—From a paper by P. B. Hammond presented to the Senate Subcommittee on Air and Water Pollution, May 6, 1970.

More and more we are accepting the fact that this Nation's advanced industrial technology and the demands of its people for a high standard of living have caused our environment to reach the level of degradation that now exists.

Our most important weapon to eliminate pollution at the lowest cost on the most scientifically sound basis is industrial technology.

A Federal fiat eliminating technical alternatives to the solution of problems should be most carefully scrutinized before final Congressional action is taken.

As this subcommittee knows, automotive emissions constitute a major segment of pollution in certain areas of the country and drastic reductions are being made and further reductions are planned for the years immediately ahead of us.

By controlling tail pipe emissions, all industries involved are able to continue to seek the best technical solutions to reach those emission standards.

The record shows that the automobile companies and oil companies are designing the vehicles and planning for the fuels to meet the standards that have already been set by the Secretary.

I believe that there is not sufficient evidence to show that proposals to control fuel composition are necessary.

I further believe that there is no reason to prohibit the use and sale of fuel additives.

One of the targets of these proposals appears to be lead in gasoline. It is the position of the Du Pont Company, a long-time major producer of lead anti-knock compounds, that these products, which have allowed the public to operate their motor vehicles at the lowest cost in the needed octane rating for cars involved, should not be eliminated if the technology we see available to control automobile emissions is applied.

For the past 10 years, Du Pont has been engaged in major research programs on fuels, engines, and exhaust emissions.

From this work, we conclude that the gasoline-powered internal combustion engine offers the best potential for the low-emission vehicle of the future.

We have developed control systems for such vehicles which will meet the 1975 exhaust emission standards; this can be accom-

plished without changes in present fuel composition and, specifically, without restrictions on the use of lead anti-knocks.

Therefore, we believe the public can have the best of both—namely, clean air and economical gasoline at octane ratings appropriate for the past, present, and future engines.

The public's desire to see improvement in the environment could very well lead to precipitous action that is not in their interest.

Selecting approaches that are less than the best available can limit our achievements and result in unnecessary costs to the consumer.

Of even greater concern is the possible effects of hastily removing lead from gasoline. Existing engines require high octane fuel that comes from the addition of a small quantity of lead to each gallon of gasoline.

In the same vein, although the question of danger to health by the use of lead additives in fuel has not been raised and our evidence indicates this to be not a problem, I want to make clear that if this is shown to be the case, the Du Pont Company will follow its long-established practice of withdrawing any product from the market that is found to adversely affect public health.

—From Testimony by Samuel Lenher before the U. S. Senate Subcommittee on Air and Water Pollution.

Who Wants Protection?

By RICHARD W. DARROW

An American who goes to sleep these nights risks a nightmare in which he finds . . .

. . . Ralph Nader designing his new automobile and telling him that's what he has to buy . . .

. . . Food and Drug Administration . . . suggesting he substitute a smoke of pot for his favorite cigarette and Scotch and soda . . .

. . . Betty Furness dictating his wife's choice of food items and the packages they come in . . .

. . . John Kenneth Gailbraith organizing a bureau to tell him what the Government has decided to do for him with his excess earnings—instead of the "stupid" things he might have chosen on his own—with his money . . .

. . . Emerson Foote, the latter day Carrie Nation in charcoal gray, prescribing how much television time can be given to his commercial messages—after the latest health warnings have been reported . . .

. . . Marshall McLuhan educating him on how to be intellectually nonintellectual and nonintelligibly intelligible.

In fact, if he sleeps long enough he can watch his whole life unfold before him, beautifully engineered, fully planned and organized—all with no mental exercise or effort on his own part. He can find himself protected against his car, his friendly neighborhood grocer, his banker, merchant, doctor, hospital, even against the bad effects of his own free choices of food, drink,

reading, TV viewing—against the risks of his own stupidity or cupidity.

And if he's a normal human being, he'll wake up wondering, "What are they trying to do to me? Who asked 'em? *Who wants it?*"

It's my thesis that the average American has no desire for—and darned little interest in—all the over-regulation, super-regulation and bevy of restrictions that masquerade today under soul-stirring symbols such as Truth in Lending, Truth in Packaging, Truth in just about anything.

I question how much he really wants his self-anointed benefactors in bureaucrat blue to be turning him and his wife and kids into nerve-racked, fear-ridden refugees from health warnings, safety scares, statistical horrors and sensational headlines.

Now I am not here to proclaim that our big brothers in government have no need for some of this well intentioned investigative attention in your and my behalf. The acts, the products, the performance of any business must be able to stand the test of close examination for honesty, fair play, full delivery of all that's promised and, of course, compatibility with personal health and safety.

I don't argue that Congressional investigations are always unwise or unnecessary.

I do point out that the boys in bureaucrat blue are awful busy in our behalf these days. And I wonder, "Who wants so much of it? Who needs it that badly?"

What I'm saying, I guess, is that we may well be at the point where we need to be protected from the protectors.

First, they're careful to see that business gets as little credit as possible for its constant efforts to serve and protect the consumer.

And second, they're pushing an almost reckless effort to convince the American people that there is a conspiracy on the part of business and industry to cheat them, deceive them and foist on them products that are unhealthy or unsafe.

And then, of course, there is the implication that industry willfully makes and sells products that are dangerous to the health and safety of the public, sacrificing the public welfare for fat profits.

These are the injustices that business and industry—and especially advertising and marketing—must combat by telling their side of the story more effectively.

The real truth is that there is very little actual untruth to be found in advertising and promotion today. Enthusiasm, yes. Persuasion, yes. Colorful presentation, yes. Provocative expression, yes. These are the elements of salesmanship—an institution as old as civilization. How insipid life would be without the age-old contest between salesmanship and sales resistance! How stifling it would be if the individual were denied the right to choose what he wants to buy.

We built a successful economy and an unrivaled standard of living on a philosophy that says consumer is king. I argue that business, not bureaucracy, discovered the consumer. And I say that business by and large has served him very well.

I wonder if the American people have the slightest conception

of what this frantic rush to protect the consumer is costing them. I wonder if they wonder, as we wonder, whether the game is worth it. Every one of these laws bears a fancy price tag in investigations, in hearings and in ultimate administration. And every one imposes heavy costs on industry for compliance with its standards and requirements. . . .

So here is the age of consumerism, of government guards for you and me, whether we want them or not. Passing fad or fancy? Likely to go away soon? I think not. . . .

And you and I and our fellow consumers who will pay the bill can only ask: "What will we get for our money? Who wants it?"

—From a speech to the Thirtieth Annual Meeting, Television Bureau of Advertising, Inc., November 15, 1967.

The Pollutionist Movement

By JOHN KENNETH GALBRAITH

There are people who think well of pollution and want to see it survive. They are deeply conscious of their present unpopularity—and they resent it. But they are gathering their forces and organizing. So far from being discouraged, they expect to win. I am in a position to say a few words about this movement. I want, above all, to correct the impression that pollution is a casual and spontaneous activity. On the contrary, it has deep and penetrating roots in the body politic.

. . . . Avowed card-carrying members are not numerous; organizationwise they are not impressive. But supporting the small hard core of true believers is a great army of fellow travelers. They do the work. And there is reason to believe that they are growing in ideological commitment.

The pollutionists are represented over the entire country, but, as might be expected, they have their greatest concentration of power in Los Angeles and New York. It is here one finds the activists and thought leaders. The acknowledged head of the Los Angeles movement, a man who lives high on the hills between Hollywood and Glendale, defends the movement, first of all, on aesthetic grounds.

"If you haven't looked out over the top of the smog on an autumn morning with the whole city out of sight below," he commented not long ago, "you haven't seen what civilization can do." In the absence of the smog, he reminds his visitors, there would be nothing but the vast, dreary expanse of the city, an oppressive wasteland of neon lights, service stations, nutburger stands, and laundromats.

And much of the support for the smog comes, in fact, from those who think it conceals the city, although many insist that it also improves the appearance of the architecture. Some say that by not seeing the city hall they think less about the city government. The supporters of pollution in the City of the Angels are law-abiding citizens; they have every intention of conforming to laws requiring

the control of pollution from automobile exhausts; they do not incline even to passive resistance. They do think that by having three automobiles instead of two, and driving each one twice as much, they can easily and lawfully neutralize even the best blow-by devices on their crankcases and have just as much smog as before.

In New York, many pollutionists also think that the Pan Am Building and Park Avenue are far better when seen through the smaze. But New Yorkers are much more inclined to take their stand in favor of the benefits from breathing polluted air. Life in the metropolis is difficult and hectic and rather alarming, and becomes, with the passage of time, ever more so. The sulphur dioxide addict reacts to the atmosphere as do the more experimentally inclined to LSD. More and more of them, indeed, refer to the New York air simply as "acid." They like Con Edison and frankly believe that any cleanup would serve only to prolong what, under the best of circumstances, is a miserable existence.

Air pollution is not, of course, the only thing that rallies the support of the pollutionists. There are chapters which support water pollution, roadside pollution, and even dirty streets. . . .

On the desert roads in Arizona, as any recent visitor is aware, one sees the work of the disposable tissue pollutionists. This state was peopled by men and women from the more inclement parts of the United States. And while they are glad to get away from the cold winters, they miss the snow. The Kleenex billowing along the roadsides is nostalgically reminiscent of snowdrifts. The older people from Iowa and Minnesota especially are deeply touched. The people of Arizona take a very strong stand on behalf of roadside pollution. So do Californians. In both states the pollutionists may even now be leading.

In Maine, Vermont, and New Hampshire, the pollution party reflects the hardheaded Yankee frugality of the natives. Once it was necessary to mow the weeds and grass and brush along the highways and country roads. This was a considerable expense. Now beer cans and disposable bottles are providing a thick glossy carpet beside the right-of-way. Soon only the odd toadstool will come through. It will hardly be worth bothering about.

The pollution movement is not static. On the contrary it has a high technical dynamic. At MIT, Cal Tech, the Jet Propulsion Laboratory, and the Manned Space Center in Houston, Texas, one encounters the cosmic pollutionists. They have the greatest vision of all—the pollution of space. When, in any one of these distinguished scientific centers, one sees a scholarly-looking man gazing into the heavens, it cannot be assumed that his interest is lunar, planetary, stellar, or even religious. Most likely he is thinking of the garbage he has helped to place in orbit.

Like most zealots, the pollutionists are mildly schismatic; they form factions and disagree amiably but vigorously. Much of the dispute turns on the limits, if any, to the constitutional right to express one's personality by discarding things wherever one damn well pleases. . . . Many pollutionists oppose throwing organic garbage out the window. Mark Twain told in *Life on the Mississippi* how you could identify an old river hand: he did not allow the water

of the great river to settle in the glass but stirred up the inch or two of sediment so as to get the full nutritive benefit. The same ritual is observed by the seagoing pollutionist cruising in Long Island Sound, Lake Erie, the Florida inland waters, or off the Manhattan sewers in the Hudson.

They have other pleasant customs. Thus they hold informal conventions and retreats at Niagara Falls. This awesome and now slightly yellowish cataract has a special, almost mystical meaning for pollutionists, much like that of Ripon for a Republican and Belmont, Massachusetts, for a Bircher. Once the mighty waters rejoiced only the eye and ear. Now they have something for the nose. Young pollutionists have revived the custom of their grandparents and go to Niagara Falls for their honeymoon. They believe that any child conceived within sight and smell of the falls will be forever filthy.

In fact, all members of the movement look forward to the day when their effort will attract a new and dynamic leader with an unqualified commitment to dirt. Nor is it likely that they will have long to wait. American cities, their empty lots, the highway approaches, the distant, distant countryside, the lakes and streams to the extent that they remain liquid, and the semisolid canopy over all bear visible, tangible, and frequently powerful testimony to the spirit that awaits only to be mobilized. Pollution may well be the nation's most broadly based and democratic effort.

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Energy – The Foundation of Industrialized Societies

(Energy Crisis?)

Energy Policy and a High Standard of Living

By JOHN G. MCLEAN

Let me begin with the facts. The United States energy problems lie primarily in the medium-term future. By medium-term, I mean through the mid-1980's. From a long-term standpoint, our basic energy position is reasonably sound. Our country is liberally endowed with energy materials. To meet our long-term energy requirements, we have large potential resources of crude oil, natural gas, coal, uranium, and shale oil.

Based on the studies of the National Petroleum Council, it appears that our requirements for energy will approximately double between now and 1985 and we shall face at least four major problems.

First. We shall have to adjust our economy to a growing scarcity of natural gas. The shortages already confronting us will unquestionably increase in severity. Under present conditions, domestic production is projected to decline by about one-third during the next 15 years. With the help of imports of natural and liquefied gas and synthetic gas from naphtha and coal, we may be able to hold gas availability at about its present level. This will, however, be sufficient to satisfy only about half of our estimated potential gas requirements by 1985.

Second. We shall need to import large volumes of foreign crude oil to meet our requirements. Under present conditions, domestic production of crude oil is projected to show little net change in the 15-year period. To meet rising demand, imports are projected to more than quadruple, reaching a level of about 15 million barrels a day in 1985—a quantity equal to the entire output of the Middle East at present rates of production.

Third. We shall have to launch a major new effort to expand our outputs of nuclear power and coal. We should seek to construct the equivalent of at least 280 nuclear energy plants of 1,000 megawatts each during the next 15 years. Today, we have the equivalent of only ten plants of such size in operation and only 46 actually under construction. Progress is being retarded by technical difficulties and environmental restraints on the selection of new plant sites.

Domestic production of coal—which quite remarkably is no greater today than it was 50 years ago—should be approximately doubled during the next 15 years. Limiting factors here, since we have adequate reserves, are primarily the availability of manpower, anti-pollution precautions, other environmental considerations, and the mine health and safety concerns.

To the extent that we fail to meet these goals with respect to nuclear power and domestic coal production, we shall accentuate our problems with respect to dependence upon oil imports, which I mentioned a moment ago.

Finally, We shall face growing problems in generating the enormous capital inputs necessary to provide for our energy requirements. Between now and 1985, the United States energy industries will have to invest between \$400 billion and \$500 billion in new productive and distribution facilities.

In sum then for the next ten or 15 years, I believe we must face up to the realities of a growing shortage of natural gas, increased imports of oil from abroad, an urgent need to expand nuclear power and coal production, and a massive problem of capital generation for the energy industries. The critical "balance wheel" in this whole situation will be the volume of foreign oil imports, because this will be the element which will adjust for our failures or successes in other energy areas. Taking all the probabilities and possibilities into account, I think this volume by 1985 will be in the neighborhood of ten million barrels a day, or greater—perhaps as great as the 15-million-barrel-a-day figure, which I cited earlier as simply being predicated on a continuation of present trends.

Let us turn now to the implications of the circumstances I have just given. I would like to suggest four points for your consideration:

First, As our imports of oil and gas grow, we shall become increasingly dependent upon foreign countries, primarily in the Eastern Hemisphere, for a vital portion of our energy supplies. At the present time, we are obtaining about 26 per cent of our crude oil and 12 per cent of our total energy requirements from foreign sources. By 1985, if we were to import ten to 15 million barrels a day, we would be drawing about 40 per cent to 55 per cent of our oil and 23 per cent to 32 per cent of our total energy from abroad.

... Most of the oil will have to come from the 11 OPEC countries, predominantly Arab, which today have 85 per cent of the Free World crude oil reserves outside the United States and Canada and account for 90 per cent of the oil exports moving into world markets. Among these 11 countries, Saudi Arabia and Iran will be of paramount importance, because they have the reserve potentials necessary to support large increases in output. . . .

Dependence upon a small number of distant foreign countries—each small in size relative to the United States—for a vital portion of our energy supplies will be a new fact of life in the economic and political history of this nation. It is a condition we have not faced before. It suggests that we will need to take a new look at all our foreign policies with respect to the Middle East and attach to them a much higher priority than they have thus far been

accorded. We shall have to remember that our domestic economy will be vitally dependent upon peace in that troubled area and continuity in the flow of oil supplies. We shall have to remember that our friends in Western Europe and Japan will likewise be heavily dependent upon the Middle East for their oil requirements. *And we shall have to remember that Russia will be the only major world power in the coming decade that will be self-sufficient in energy resources.* . . .

Second. Our growing requirements for oil and gas imports will provide a large and growing deficit in the United States balance of trade in fuels. . . .

What will we sell and to whom? We cannot look to our usual trading partners, the industrialized countries of Western Europe and Japan, because most of them will be struggling to increase their own net exports to pay for growing fuel imports. Ultimately, the situation can come to equilibrium on a worldwide basis only when the oil exporting countries are able to absorb greatly increased imports from us and the other oil importing countries. But, as we have noted, the major oil exporting countries are few in number, and in the very early stages of industrial development. They do not have the populations, mass consuming markets, and economic infrastructures to permit the ready absorption of large imports from us. Much thought needs to be given to what they can reasonably buy from us and the time schedules on which they will be prepared to do it.

Third. Our growing purchases of crude oil and natural gas, coupled with those of the other Free World consuming countries, will create a major new center of financial power in the world money markets. By 1975, the 11 OPEC countries will be collecting oil revenues at the rate of about \$25 billion per annum; by 1985, after allowing for volume and price increases, the tax revenues could amount to as much as \$50 billion per annum. In the 15-year-period 1970-1985, the total funds flowing to the OPEC countries could aggregate as much as half a trillion dollars—approximately nine times the amount they received in the prior 15-year period.

Fourth. As we move from a long period of abundance to a time of growing scarcity in energy materials, our economy will certainly experience rising energy costs. We have already exhausted a large share of our cheapest and most easily accessible energy materials, and new indigenous supplies will necessarily come at higher prices. Coal mines will be farther underground; oil and gas wells will be drilled to greater depths and increasingly in deeper waters offshore; the development of oil shale and synthetics will require expensive new technology. All of these things mean higher costs. Higher prices will also be needed to invoke the large capital inputs to the energy industries that are required to meet our future needs.

These projected increases in energy costs are significant, but I believe they can be absorbed in our economy without serious disruptive effects—although the impact will certainly vary from industry to industry depending on the importance of energy as an element in the cost of manufacturing.

I come now to the third and last part of my talk. If my assessment

of the facts and their implications is correct, what should we do about it?

First. We should take prompt action to establish a single, high-level agency in our government to develop a comprehensive national energy policy and to coordinate all our national efforts relating to energy matters. I do not mean to suggest that our federal government should play a larger role in the discovery and development of our natural resources. This task should be left to private enterprise. The chief mission of the central government agency should be to establish priorities and guidelines and to eliminate the delays, conflicts, and confusion that presently prevail among the many different agencies involved in energy affairs.

Second. We should take all possible action to stimulate and accelerate the development of our indigenous energy resources. We have an adequate resource base; our problem is to get new supplies into the market fast enough to meet our requirements in the years immediately ahead. To this end, several steps would be desirable.

We need some practical trade-offs in the ecological area. The facts are very simple. The production and consumption of energy inevitably involve some degree of ecological impairment. We cannot achieve our environmental goals overnight—desirable though that might be—and still give the U.S. economy all the energy it requires and the public demands. Some pragmatic, graduated approaches to our ecological goals are urgently needed. Here is an area where the federal government should cut through the maze of political bickering and bureaucratic confusion presently beclouding the issues and take decisive action—and very promptly.

We need to decontrol natural gas prices and to establish that the price of synthetic gas manufactured from coal and naphtha will not be subject to federal restraints.

We need to accelerate the leasing of federal lands on reasonable terms for resource development. This is particularly true with respect to the Outer Continental Shelf which contains some of our most promising potentials for new oil and gas discoveries.

Third. We should initiate strong programs to reduce waste in the consumption of energy throughout our entire society. I am not suggesting curtailments in the consumption of energy which would have a negative impact on the growth of our economy. On the contrary, I believe the consumption of energy should be encouraged because it inevitably increases the overall efficiency of our economy—providing that the energy is used effectively for socially desirable ends.

Finally. I believe the time has come when we should lift our concern with energy matters from the national to the international level. Most of the major industrial nations of the Free World will be facing essentially the same energy problems as we do. Clearly, the situation provides a wealth of opportunities for cooperative research and engineering in the development of new energy sources. Clearly, there is a need for cooperation in the development of a sound framework of political relationships with the countries of the Middle East to promote stability and peace in that area. And, clearly, there is a need for some type of cooperative action among the major oil

consuming countries to establish a sound, long-term relationship with the powerful Organization of Petroleum Exporting Countries already in existence.

—From a speech to the World Affairs Council, Pittsburgh, September 21, 1972.

Nuclear Energy—a Solution to the Energy Crisis

By WILFRED E. JOHNSON

I am persuaded that . . . the United States is not needlessly and wastefully generating and using electric energy. The fact is that we need power for either purifying or recycling wastes of all kinds and this, of course, is one key to a liveable environment. As population grows and we rub elbows more and more, we simply cannot sustain the standard of living we now enjoy let alone improve it and extend it for all our people unless we produce more electric power for each person.

What will our electric needs be over the next twenty years? By 1990, per capita gross national product probably will have grown by eighty per cent so that each man, woman and child in the United States on the average, will be able to buy almost double the products and services he now does. This kind of growth will be possible only if an adequate supply of electric energy is available. If past trends are a reliable indicator, we will need almost four times our present generating capacity by 1990. Unless we provide this generating capacity, the transportation industry, the factories, knitting mills, refineries, steel mills—in short, the tools of our economy will not be able to increase their output as they should, and our society itself will falter—our political institutions may be imperiled.

The first thing to think about when we talk of increasing the supply of electricity is the supply of fuel, and of the various fuels, those of most immediate importance are the fossil fuels—coal, oil and gas. By the end of this century, even if nuclear generating equipment produces half of our electrical requirements, we may still need more than double the amount of fossil fuel we are using today for the generation of electricity. So, unless we can produce enough coal or oil for use as fuel and do it economically, we will have some lean years ahead. I stress the word economically because we have ample reserves of coal in the ground but the challenge is to get them out cheaply; to get them shipped cheaply; and to burn them cheaply while controlling their noxious combustion products. . . .

Oil will certainly play a major role in providing our energy requirements for some years to come. It, too, has its problems with air pollution because of sulfur content, but perhaps more important for the long run is that any continuing shortage of coal is apt to put such heavy demands on our oil reserves as to diminish them unduly from the standpoint of our best interests.

. . . most people can agree with Glenn Seaborg in saying nuclear energy was discovered in the nick of time because we certainly do

need new fuels and we believe that nuclear fuels can greatly ease the overall energy picture from the standpoints of conservation of resources, the environment impact, and of economics.

We are at the present time experimenting a "national energy crisis." Compounded of many factors, the solution of this problem is not presently in sight. Unless a solution is found, the economy and our standard of living may both falter and even decline, and the extent to which this would imperil the fabric of our society and our democratic institutions cannot be exaggerated. Energy is such a basic commodity that its rationing would bring about basic and undesirable changes in our economic and political fabric.

The proper use of nuclear fuel can help to solve the energy crisis—but it cannot do it alone. Solutions must also be found for the production, distribution and clean and economic utilization of fossil fuels in adequate amounts.

There is a time limit on the present inefficient methods of utilizing nuclear fuels. Today only about two per cent of its available energy is utilized and supplies of this fuel will become expensive and perhaps marginally economic unless the more efficient breeder (which can use fifty per cent of the energy in the fuel) is introduced.

Introduction of breeder reactors and their commercial establishment present difficult and serious financial problems to the electric power industry. The government has helped and in my opinion will continue to help in the research and development area. The government will also provide limited assistance in the demonstration phase. But the utility industry itself must provide the leadership and a major portion of the financing of the demonstration phase of development. It seems evident that the utility industry must consult with its regulatory bodies and that new rate policies and/or new accounting policies must be set that will permit adequate financing of power plant design and development.

Finally, and closely related to the question of the source of financing for power plant development is the question of who directs the development program—and how do we assure that sound and realistic judgments are made in setting objectives and assessing priorities for developing effective power systems. In the last analysis, I believe this is a total system problem that must include system design, the optimum choices of power generating and transmission equipment, of power plant sites and environmental compatibility. These matters require strong utility leadership. They can no longer be the subject of uncoordinated local decisions. Planning must be coordinated on a regional and national scale. In my view, it is clearly in the interest of the utilities to accept this leadership.

There is substantial truth in the old adage—"He who pays the piper calls the tune." In my personal view, this could well prove to be a prophetic admonition to our utility industry—investor owned and public—which had done such a remarkable job over the years in meeting the nation's needs for ready kilowatts of electricity. If this industry, with a sympathetic government, cannot devise ingenious ways to bring about the kind of truly advanced technology that the coming decades demand, then ways will nevertheless be found to meet our national needs and they may prove to be insensitive

to the traditional independence which has characterized decision making in this pluralistic industry.

—From a speech before the Fifth Intersociety Energy Convention Conference, Las Vegas, Nevada, September 22, 1970.

Restrict Energy Use

By MICHAEL MCCLOSKEY

Present rates of energy growth are unrealistic for a variety of reasons. Basically they are unrealistic because these compounding rates of growth cannot be projected very far into the future before they run up against all sorts of limits—mathematical, physical, biological, and qualitative ones.

Today we consume fifteen times the energy we did one hundred years ago, though our population has only tripled in that time. Over the past decade the average growth rate in the consumption of energy in all its forms has been more than 4 per cent annually, climbing to about 5 per cent annually over the last five years. Growth has been particularly phenomenal in the electrical energy sector, at about 7 per cent annually in recent years. Projections based on that rate of growth call for a doubling of electric power production about every ten years.

Ultimate limits to growth in energy use obviously exist in the finite nature of our fuel resources. The fossil fuels now provide by far the greatest part of our energy sources.

Though nuclear power is expected to play a major role in future electrical energy production, electrical energy is of course only a part of the total energy consumed (presently, about one-quarter). And the supply of uranium 235 from high-grade ores is limited. The NAS report indicates that the production of nuclear power using the present type of reactors and uranium 235 as the principal energy source can be sustained for only a few decades. Breeder reactors could extend these fuels, but it is not clear what the costs may be and operational and environmental problems are unsolved. And a practical method of producing electricity from fusion is still only a possibility.

Long before ultimate limits are reached the environmental impact of unrestrained energy growth may become unbearable. We do not know where the dividing line between environmental deterioration and irreversible catastrophe may lie, but at the least, we can foresee that galloping energy consumption will have a continuing and cumulatively destructive impact upon the environment.

At every stage of energy production and use unacceptable environmental degradation occurs. At the first step of extracting fuels from the earth, defacement and pollution occur in the source area. For example, by 1965, 3.2 million acres of United States land had been surface-mined, 41 per cent for coal. And, as we deplete our high-grade reserves we increase our destruction of the land: the strip-mining method of producing coal has been steadily increasing,

from 29 to 36 per cent in the last ten years. Today, strip mine benches in nine Appalachian states extend for 20,000 miles.

Uranium mining and milling has its own special hazards of radioactive wastes, in addition to the usual effects of mineral extraction. A typical uranium mill must dispose daily of about 10 curies of radium in its process wastes, a considerable amount. . . . The production of uranium has also resulted in the accumulation of mill tailing piles—in sizes up to several million tons in the Colorado River basin, for example. In most cases, for many years no containment measures were undertaken, and these piles were left exposed to erosion by wind and rain.

Fuel extraction has polluted our waters as well as defacing our lands. Coal mining has degraded 12,000 miles of Appalachian streams alone, through mine acid drainage. Extraction of oil also seriously pollutes the source area; the Santa Barbara blowout and Platform "Charlie" in the Gulf are but two familiar examples of marine pollution from offshore oil wells.

The transporting of fuels from the source area to points of utilization and the handling and processing of these fuels, lead to further environmental degradation. Illustrations familiar to everyone are the numerous oil spills from vessels, marine terminals, refineries, storage tanks, pipelines, and so on. . . .

Oil pollution illustrates not only the hazards of accidental spillage of oil transported as cargo, but also the intentional pollution resulting from current modes of operation within the marine transportation system itself. Current estimates are that approximately ten million tons of oil are spilled each year into the marine environment. . . . Severe biological damage is reported in main shipping channels as a result (one expert estimates that 40 per cent of all sea life has already been destroyed by pollution of all types).

The extracting, processing and transporting of fuels which will be used to provide energy is only the beginning of energy's environmental impact. The production and use of energy in all its forms has created severe pollution and space problems which threaten to become overwhelming in the near future.

Air pollution is perhaps the most obvious environmental by-product of energy production and use. The fossil fuels presently account for almost all of our energy sources (96.4 in 1969), and the burning of these fuels creates the largest share of many of the common air pollutants. Motor vehicles lead the field, accounting for over 60 per cent of total air pollutants. Power plants, and industrial, residential and commercial use of energy all make their characteristic contributions to air pollution.

Another serious pollution problem generated by growing energy consumption is the thermal loading of our rivers and lakes. Electric power plants are major offenders accounting for about 80 per cent of the industrial waste heat discharged into our waters. Such plants are about one-third efficient in their use of heat to generate electricity, and most of the remaining waste heat is discharged directly into the cooling water source. . . .

Other types of energy-associated pollution are becoming of increasing concern as well. For example, some scientists estimate

that coal fired power plants put 150 tons of mercury into our air every year. And chemicals such as chlorine, biocides, and various other compounds added during the power generation process are not now being recovered but are released into the nearest body of water. Some of these can cause serious disruption of aquatic environments, as well as rendering certain shellfish unfit for consumption.

The solid waste problems associated with energy production and use are tremendous. For example, by burning coal we produce an estimated 30 million tons of slag and ash every year, of which 8 million enter the air, the rest contributing to our mounting disposal problems. . . .

As nuclear power assumes a greater role in the production of electricity, we may have to come to terms with a new and frightening form of pollution, that of radioactivity. It has been predicted that by the year 2000 nuclear power will account for about one-half of our power production. . . .

Nuclear plants may justly be called a still experimental form of power production. Though the chances of a major accident have been minimized by industry and government, such a possibility cannot be completely ruled out. The safety record of plants already built gives us cause for concern. By the end of 1968, 17 civilian plants and one military nuclear plant had been completed, and as recently reported in "Science", five of these had been shut down as uneconomic or unsafe; a sixth (Fermi) never operated properly and finally an accident took it out of service; a seventh (Humboldt) has operated within allowable radiation limits only by reducing power output.

Another problem associated with nuclear energy is the management of the high-level radioactive wastes produced. These wastes are handled, transported and processed (which adds to the risk of accidental catastrophe), and must ultimately be disposed of. The storage problem alone is immense. Can we safely assume that this legacy of long-lived radioactive wastes can be contained by future generations for hundreds and thousands of years to come? . . .

Finally, we are confronted by grave space problems brought on by spiralling energy production and use. Short of the ultimate limits already noted, the amount of land used for energy-related activities may become environmentally unacceptable in the near future. Such uses include the paving of land for freeways to accommodate our auto-based transportation system and its related "needs," such as parking lots, gas stations and so on; the use of land to build more and more power plants and string more and more transmission lines; and covering our land by industrial installations of all kinds, each consuming energy and many turning out frivolous, wasteful or soon-obsolete "conveniences."

It is no accident that we confront such bleak prospects in our energy future. We face cries of immediate fuel and energy shortages because the energy industry has contrived crisis situations, and the growing amount of interlocking ownership in the fuel industry facilitates this. And finally, the industry has contrived in many ways to have public policy artificially stimulate demand for energy. These factors act in concert to produce the so-called "energy crisis."

Finally, we are confronted by grave space problems brought on by spiralling energy production and use. Short of the ultimate limits already noted, the amount of land used for energy-related activities may become environmentally unacceptable in the near future. Such uses include the paving of land for freeways to accommodate our auto-based transportation system and its related "needs," such as parking lots, gas stations and so on; the use of land to build more and more power plants and string more and more transmission lines; and covering our land by industrial installations of all kinds, each consuming energy and many turning out frivolous, wasteful or soon-obsolete "conveniences."

Not only is industry in a position to withhold supplies to wring concessions from government, it has also been fabulously successful in persuading government to stimulate demand in every possible way. For over a century, a pro-growth bias toward energy use has been woven into the fabric of public policy. . . .

How then do we extricate ourselves from the dilemmas of this contrived pattern of exponential energy growth? While no simple answer exists, an interim strategy can be tried. It consists of making a number of simultaneous changes in public policy to reduce rates of growth. . . .

A short-run strategy would involve the following types of changes in public policy: ending or reducing the many biases in public policies which provide incentives to energy growth; maintaining and strengthening environmental constraints on energy growth; reducing energy demands by educating the public to understand the importance of conservative use of energy; encouraging intensified research and development on ways of achieving greater efficiencies in energy utilization and in finding new, more environmentally acceptable energy sources; discouraging growth in industries that are the most profligate consumers of energy; and establishing new agencies in government to plan and regulate activities. Each of these changes involves efforts that go well beyond the traditional bounds of energy policy, and all can have profound economic and social impacts. Yet changes are already beginning to occur in all these fields, and the environmental movement is determined to promote them. . . .

—From a speech to the American Nuclear Society, Boston, Mass., June 15, 1971.

Costs of Public Energy Demand

By C. HOWARD HARDESTY, JR.

During the next 10-15 years this nation will be faced with critical energy supply problems. . . . I submit that all of us—energy suppliers, distributors, consumers and the press—got into this predicament by serving what we at one time thought to be the best interests of the American public. You may find that your own experiences during the past 10-20 years will support my recollection of how it happened.

I said we got into this predicament by serving the public. Perhaps I should say that we served the public's *wishes*, which may or may not be the same thing as the public's best interest. And what was the public's wish? The public wanted *cheap energy* in all its forms.

If you were working in the utilities, you remember how the public reacted to requests for rate increases. If you were working in the media, you remember how such requests were regarded and the sort of editorial treatment they got. But wasn't it justifiable? Wasn't the defeat of rate increases a holy cause? What a shining way to serve the public! Stand fast, say "No" to the distributor and let him curb his plans and pass the bad news back to the producer: "The public wants its energy cheap; how you cut costs is *your* problem."

After all, how could communities bring the good life to their citizens? Why, the go-getter towns and cities and the envied Chambers of Commerce could woo new industry and expand what they already held. With what? With cheap energy. A smokestack and an industrial plant was a community's badge of honor—you can still see a few in civic murals—because it signaled jobs and prosperity. The whole thrust was to strengthen our economic base, and neither civic nor business leaders, the press or consumers wasted much attention on the environmental consequences. And *nobody* lost any sleep over the fact that competitive circumstances did not permit energy suppliers to price their product to provide for proper land reclamation, and the elimination of air and water pollution.

Recall with me, just ten years back, and try to imagine what answer a salesman would have gotten if he had said, "Yes, we can deliver coal for \$3.75 a ton, or crude oil for \$1.75 a barrel, but we'll have to build in another 50 cents for pollution devices, a dollar for health and safety research and another 50 cents to eliminate sulfur." He would have been told to shut his mines or plug his well, and many were—for lack of orders. To have dreamed of today's social and environmental requirements might have indicated wisdom, but it was also a fast track to bankruptcy.

Isn't that how we got into this predicament—by serving the public's desires, by feeding its appetite for a prosperity purchased with cheap energy? The American people were buying affluence on margin, and their brokers failed to warn them that cheap energy has hidden costs—like polluted air, polluted water, ruptured and abandoned landscapes.

A lot of us must share responsibility for this, all of us who knew what was really happening—and those who didn't but pretended that they knew. The public had a right to learn the truth. The public didn't press its right to know, and nobody disillusioned them. . . .

It was the day of the cost-cutter, the buyers market, the so-called efficiency expert, the corporate magician who tried to undersell nature itself. It was a remarkable performance, and the public loved it. As opinion analyst Daniel Yankelovich has noted:

From the end of World War II until the late 1960's business grew and prospered in a warmly supportive social/political environment. In the 1950's and 1960's business got the coun-

try what it wanted—a huge GNP, a booming economy, full employment, and for the first time in history, affluence for the majority of the people.

You know what the polls are telling us now: public confidence in business is at a record low—because the public is finally getting the bill, the full accounting. As Opinion Research Corporation reported on its nationwide survey last year:

There is strong evidence in the findings that the public is disenchanted with industry's performance on issues of ecology and expects companies to work harder on curbing the pollution of air, water and land.

... Ask yourself, what does the public want today? It still wants energy—

in sufficient supply
from reliable sources
without environmental damage
without threat to health or safety
without peril from radiation
without offshore drilling
without surface mining—
and it *still* wants it *cheap*.

All of these desires are understandable, but we can't have them *all*—not in the same world. The trouble is that we do keep wishing for all of them—in one world, at one time, inside one and the same inconsistent frame of mind. Ask a consumer if he is for cleaner gasoline. Ring his doorbell, and he'll give you one answer. Ask him when he pulls his car up to the pumps, and he'll give you another.

We want coal, but we don't want surface mining. We want plenty of low cost-low sulfur fuel oil, but we don't want ships, terminals or refineries on our shores. We want increased supplies of domestic energy, but we don't want to explore the highly potential offshore areas. We want more imports of crude oil, but we don't want to give the nations of the Middle East a stranglehold on our economy. We want to be more selective in our use of natural gas, but we resist letting market forces dictate consumption through realistic pricing. We deplore a brownout, but continually resent the siting of nuclear plants in our neighborhood. We want ingenuity in the coal industry and yet we resist diversification.

When will we as a nation wake up to these destructive inconsistencies? How can we clearly bring into focus that the time for important, crucial decision making is now—not tomorrow? . . .

First: Let's assume you are against surface mining and seek its abolition. . . . Do you reflect upon or mention the following:

- a) What fuels will be substituted for coal production lost through abolition of strip mining?
- b) Where will the substitute fuels come from, a neighboring state, the Middle East or an even more environmentally destructive source?
- c) What will be the cost and the lead times necessary for the supplier and consumer to develop replacements?
- d) What are the pollution and environmental characteristics?
- e) If an alternate is not available, what are the social and finan-

cial implications to our economy of inadequate energy supplies?

- f) How much extra will we have to pay for electricity generated from other fuels?

Second: Let's assume you oppose the leasing, exploration and possible development of the prospective east coast offshore oil and gas structures. When you write your article featuring in living color the problems associated with oil spills, tankers, terminals, pipelines and refineries, will you include inference to the following:

- a) What will be the impact on world crude prices as America joins Japan and Europe in competing for finite crude oil supplies?
- b) What will be our standby sources of energy if the nations of the Middle East for any reason, economic or political, close the valves?
- c) What is the cost and what are the lead times needed to develop standby sources, if available?
- d) What will be the effect on our nation's balance of payments when we import 14 million barrels of oil per day?
- e) What will be the cost to the consumer to build a system capable of handling a quadrupling of crude oil imports?
- f) How many jobs will be lost as exploration, production and refining operations are located abroad rather than in the United States?

Third: Let's assume you oppose the licensing, siting and construction of a nuclear power plant. . . . Have you made reference to the following:

- a) What alternate methods of generating electricity will be used to meet escalating demand and to replace ancient and inefficient stations?
- b) What is the cost to the consumer of delay and procrastination in terms of brownouts, blackouts and inadequate service for want of generating capacity?
- c) Have you mentioned the number of nuclear stations that must be built between now and 1985 if this form of energy is to assume even a minor role (17 per cent) in the energy equation by 1985?
- d) How many times have you detailed the economic impact of a "no growth" philosophy on the people of this nation?
- e) Who will ultimately pay the additional \$2-3 million for each month's delay in construction of a new nuclear power plant?
- f) Where will the reserve of 100 million barrels of oil per year come from to replace the 10,000 megawatts of nuclear capacity that is being deferred?

. . . We are approaching a day of reckoning in this nation and I prefer to have my concerns a matter of record. We are no longer able to take strong, unequivocal, adamant positions on these important matters of energy and environmental because abundant low cost, environmentally clean alternates do not exist.

-From a speech to Public Utilities Association of the Virginias News Seminar, Pipestem, West Virginia, May 18, 1972.

The United States has a natural resource base adequate to meet its energy requirements well into the next century.

The United States faces a critical gap between energy supply and demand—a gap that will widen dangerously before the end of this decade.

How do you reconcile these conflicting statements, both of which are true?

It's a matter of timing. Timing and billions of dollars.

Just what is the gap between energy supply and demand?

This: We use more energy than any other country in the world. Oil and natural gas supply three-quarters of our raw energy, and our energy consumption will double by 1985. But proved domestic reserves of traditional low-cost energy are inadequate to supply this demand.

It's the relatively short term that's critical. In the longer term—say, 15 to 20 years or more—we can narrow the gap considerably and again become almost self-sufficient in energy.

If, that is, we use our heads and start planning now. Our planning must comprehend three overlapping time frames.

Time frame 1: For the next 10 to 15 years, we'll have to rely primarily on conventional oil and natural gas. These offer our best short-term hope of narrowing the energy gap. Additional domestic reserves are there to be found—mostly beneath the waters of our outer continental shelf. These oil and gas deposits can be discovered only if the federal government conducts lease sales on an orderly basis that facilitates planning.

Toward the mid-Eighties, nuclear power will have to play an increasing role in generating electricity and freeing up fossil fuels for other uses. If this is to happen, the federal government may have to play the decisive role in the siting of nuclear plants.

This first time frame is so critical to our country's economic security that we have almost no options in our choice of energy sources.

There are, however, some steps we can take. We can import more and more oil and gas; in fact, we'll have to. Europeans have been doing this for years, and without panicking. We can take still another leaf from their book: security stockpiles of oil, to tide us over any real emergency.

Time frame 2: Beginning around 1985 we'll see heavy and growing stress on synthetic oil and gas from coal and shale, and continued emphasis on nuclear power. Coal is our most abundant fossil fuel. Oil shale deposits contain billions of barrels of recoverable oil. But years of continued research, and billions of dollars, lie between us and *economic* fuels from these two energy sources. It's going to challenge the capital markets as much as it does scientists. Only adequate incentives can induce the amount and types of research and capital outlays that will be required.

Time frame 3: By the end of this century or before, fusion and solar energy can probably begin to take up some of the slack. This will require major scientific and technological advances. Again, money will be a critical ingredient.

The key to meeting energy demand will be the return on invest-

ment of companies in the energy industries. The worldwide capital requirements of the petroleum industry alone between now and 1985 will come to about \$500 billion. That's half a trillion, or over \$100 million a day, day in and day out.

No oil company will be able or willing to borrow and invest on this unprecedented scale unless the rate of return—the ratio of earnings to assets—is sufficiently attractive. For the past several years, however, U.S. oil companies' rate of return has been below that of U.S. manufacturing as a whole.

So, painful as the idea may be, petroleum product prices are going to have to rise if oil companies are to generate enough profit to amass the capital needed. It's the only way to ensure enough energy to support living standards even at their present levels. And many millions of poor people in this nation insist—quite properly, we think—that maintaining the present living standards simply isn't good enough.

—From an advertisement of the Mobil Oil Co., October 5, 1972.

Strip Mining Destroys Environment

By KEN HECHLER

From the tribal lands of the Hopi and Navajo to the rugged hills of Appalachia, giant gouging machines are ruthlessly ravaging the land to get at *valuable seams of coal close to the surface*. When a supercolossus like the eastern Ohio earth-mover called "Big Muskie" picks up 325 tons at one gulp, a jumble of topsoil, rocks, small trees, flora, fauna and wildlife habitat are chewed up and spewed out with awesome results. *The scalping and decapitation give the land the look of the surface of the moon. Spring rains on the exposed rocks produce sulfuric acid runoff, deadly to aquatic life. Streams fill with sediment and overflow their banks. The loosened land cover is highly vulnerable to landslides. Even the water table is shaken by the blasting.*

Strip mining is escalating by the hour, in the 25 states where 128 billion tons of strippable coal exist. Yet well over five times that amount is recoverable by underground methods, and even the strippable coal which is not very close to the surface could be recovered by deep mining methods. The difference in technique is simple: *deep mining removes the coal from the earth; strip mining removes the earth from the coal*. Ten years ago, 29 percent of the nation's coal came from strip mining; a few months ago, the figure was 35 per cent, but it is now rapidly bumping 40 per cent and still rising.

On February 18, 1971, I introduced H.R. 4556, to ban all strip mining of coal six months after the enactment of the bill, and to prohibit any underground mining of coal in national forest and wilderness areas. Instead of placing enforcement in the Department of the Interior, whose activities include stimulating a constantly higher production of minerals, my bill is enforced by the Environ-

mental Protection Agency, which now handles air and water pollution control and is better equipped as a regulatory agency. The response to my bill was immediate and heartening.

Coal operators joyfully proclaim that strip mining is cheaper. This is utter nonsense. No coal operator has to pay a cent in environmental costs. If the strip miners had to compute the damage they do to the soil, forests, hillsides, and streams, then it would turn out to be a very expensive way to extract coal from the land. Of course, there is a more immediate and compelling reason why strip mining is increasing at such a rapid rate: the strippers know that an outraged public will sooner or later clamp down and put a stop to this assault on the environment, so they are making a killing while they can get away with it.

Carl Bagge, President of the National Coal Association, has led the charge against H.R. 4556, on the grounds it would cause an immediate "energy crisis" by depriving the nation of over one-third of its coal. He overlooks the 750 billion tons of coal recoverable by underground mining. Whenever efforts are made to protect the environment, there are those who rush forward to charge that such protection will create an "energy crisis," as though we are doomed to be prisoners of onrushing technology instead of our own destiny. Obviously, energy development and environmental quality must go hand in hand, and it's about time we decide once and for all that they are not mutually exclusive or incompatible.

A second argument levelled by the lobbyists against H.R. 4556 is that it will throw thousands of people out of work. Even the Director of the Bureau of Mines swallowed this argument by publicly announcing that 20,000 people would lose their jobs immediately if strip mining were abolished. Those now concerned about jobs gave little attention to the 300,000 miners displaced when the underground coal mines were mechanized in the 1950's. Many of the jobs in strip mining are highly skilled occupations, easily transferable to road construction or housing. *But strip mining is like taking seven or eight stiff drinks: you are riding high as long as the coal lasts, but the hangover comes when the coal is gone, the land is gone and the jobs are gone and the bitter truth of the morning after leaves a barren landscape and a mouth full of ashes.* The tourist and recreation potential of a stripped area is nil; in fact, far more jobs are provided for the future through protection of the environment. Rep. John Seiberling (D. Ohio), a strong supporter of my bill, has added several amendments to give priority in job placement, as well as 52-week cash payments and relocation allowances to those workers displaced by the abolition of strip mining.

The third argument advanced is that "reclamation" can make strip-mined land better than it was before it was disturbed. Bethlehem Steel Corporation ran some multi-color ads in *Time* and *Newsweek* magazines, depicting a blue fishing lake in Kentucky where a strip mine once existed. A skeptical *Baltimore Sun* reporter wrote: "If you circle the lake carefully, you can find a narrow angle from which, when the light is right, the proper filters are used, and the background forest is at season's peak, it all looks like a cameo from a Sierra Club publication. But don't look left or right. What

you see there is characteristic of all strip mines: coal slides into the water, scars in the mountainside . . . gritty dust blowing from the irreparable gash in the slope opposite." The fact is if enough money is poured into a "showcase model" which photographs well in color, it is possible to reclaim stripped land, but it is uneconomic to pour that kind of money to "reclaim" all stripped land.

In West Virginia, the Surface Mine Association found a happy solution. They changed their name to the "West Virginia Surface Mine and Reclamation Association," announced they are raising \$180,000 to advertise the beauties of "reclamation" and immediately launched a media saturation campaign.

-From testimony before House Committee on Interior and Insular Affairs, September 20, 1971

Why Fusion?

By WILLIAM C. GOUGH

. . . If we don't get an unlimited energy source that is relatively inexpensive or at least somewhere close, we will be in trouble. We will be unable to support the large world population at a standard of living anywhere near what we have now in this country or even what less fortunate countries now hope to obtain.

There are three principal factors that determine the timescale to obtaining power producing fusion reactors. First, is the combination of the physics, technology, and economics that establish what we call feasibility. Next, is the scientific and man power base upon which the research and development program can build. And third are the financial resources available to support the program. We should recognize that it isn't the United States who is determining this time scale because we're less than a fifth of the world effort in fusion. . . .

Let's look at the first question on reactor feasibility. Fusion, unlike fission, does not require the proof of any new physical process such as the fission chain reaction which is commonly considered the proof of "scientific feasibility" for fission. There is no need for a chain reaction in a controlled fusion reactor. Our sun and the stars demonstrate that we can get net energy from fusion. However, to obtain useful fusion energy on earth, requires that we generate the hot plasmas and confine them for long enough. To accomplish this an extensive effort in fusion plasma physics has been underway.

. . . We are now at a point in fusion plasma research where developments in technologies can bring us closer to feasibility.

. . . Over the next 30 years, the U.S. will probably spend somewhere between 500 billion and 700 billion dollars on research and development, using the scientific manpower that we have available and are training in this country. What we do with that research and development will determine what will be the benefits to our

society at the end of that time. We are making our commitments now on how that money is to be used and what programs it is to support.

. . . As we pass into a stage where more technology must be done in order to prove feasibility we are forced into a tradeoff. To hire additional engineers to do the technology we have to reduce the number of physicists working on the program. . . . We could make the assumption that we, or some other nation, expands and really tries to obtain fusion power from fusion as rapidly as possible. People have given me estimates that vary between 7 and 12 years.

-From Report of U.S. Atomic Energy Commission, June, 1970.

10

National Security and Environmental Impact

(Controlled Environment?)

Chemical and Biological Testing for Deterrence

By HENRY REUSS, RICHARD MCCARTHY and The U. S. Department
of The Army

Mr. Reuss: . . . We open hearings today on whether open-air testing by the Army of persistent lethal agents is endangering the environment. These lethal chemicals and biological agents are tested at the Dugway Proving Ground, of the U.S. Army Materiel Command, located on the eastern edge of the Great Salt Lake Desert in the State of Utah.

The area west of Dugway Proving Ground is largely uninhabited and consists of barren salt flats. But to the north and east of the proving ground are Utah's principal cities, forests, vacation sites, grazing lands, and one of the Nation's major series of wildlife refuges and wildlife management areas. Prevailing winds blow from west to east.

Directly to the north and east of the proving ground are Skull Valley and Rush Valley, inhabited by ranchers and the residents of a few small communities. In these valleys are public lands administered by the Bureau of Land Management as well as private lands, on which horses and cattle graze throughout the year, and sheep graze from November to May. A network of local roads in the valleys is, of course, traveled by visitors and residents alike. Paralleling the northern boundary of the proving ground are the Western Pacific Railroad and U.S. 40, a major transcontinental highway leading west from Salt Lake City.

Within a 100-mile arc radiating from the northeastern edge of the proving ground are the major cities of Salt Lake, Logan, Brigham City, Ogden, and Provo, as well as numerous smaller cities and towns. In this area live 95 percent of the human population of Utah

These, then, are some of the people and natural resources immediately endangered if poisonous chemicals or deadly viruses should escape the boundaries of the proving ground. In March of last year, an airplane spray test at Dugway of the nerve gas, VX, appears to have caused the death of more than 6,000 sheep. The sheep were grazing in the adjoining Skull and Rush Valleys, in locations up to some 45 miles from the test site.

The sheep disaster demonstrated that the air above Dugway Proving Ground can't be counted on as a contained test chamber. The

air moved and carried with it some part of the toxic cloud of VX. Had the wind been stronger, the cloud could have moved even farther and possibly brought death or injury to a much wider arc. The question, therefore, is whether it is possible both to release lethal chemicals, germs, or viruses into the air and to assure the safety of people, domestic animals, and wildlife using the air. . . .

Mr. McCarthy: . . . One of the first questions that must be asked is why must there be field testing of chemical and biological agents? The Defense Department states that it is our policy to develop and maintain a limited offensive capability in order to deter all use of CB weapons by the threat of retaliation in kind. Normally, development of such a capability involves the field testing of weapons systems so that we know their effectiveness. With the exception of Yemen and Vietnam, there has been no recorded use of gas in the last two decades. The only large scale use of gas occurred in World War I with agents that are now out of date. There has been no recorded use of biological warfare in the 20th century. This lack of experience places pressures on the Department of Defense to test their new weapons. . . .

How does the Army's test record of CB agents stack up? On March 13, 1968, the U.S. Army tested VX nerve gas at the Dugway Proving Ground, Dugway, Utah. An Air Force plane released VX from a spray tank at the correct altitude. Yet when the pilot attempted to stop spraying he was unable to cut it off. The gas continued to spray out of the tank as the plane gained altitude. The gas was then carried by winds outside of the boundary of the proving ground onto adjacent grazing lands used by Utah sheepherders. The next day sheep began to die. Eventually about 6,400 died.

On March 20, 1968, the Dugway public information officer, Tom Donnelly, denied that Dugway was running any tests that would cause the sheep deaths. Yet the next day, Senator Frank E. Moss of Utah received from the Defense Department confirmation of the VX test. On March 24, 1968, an anonymous spokesman at Dugway denied that there was any connection between Dugway's activities and the sheep deaths. . . .

I understand that the National Communicable Disease Center of the U.S. Public Health Service in Atlanta, Ga., identified the substance found in the sheep as the same as VX.

(The National Communicable Disease Center report, "Investigation of Sheep Deaths—Skull Valley, Utah," appears in the appendix of this hearing record, p. 246.)

I further understand that their investigators at Dugway expressed concern that the effects of the VX nerve gas, sprayed in a 100-mile cone, would last anywhere from 2 to 3 years. And I am further informed that tests of sheep at different points around Dugway showed that all of them had received low-level exposure to nerve gas at some time. This information has not been made available to the public. . . .

I am of the opinion that the active testing of biological warfare agents is as dangerous to the United States, and for that matter the world, as it is to a potential enemy. Tularemia, a disease that is not generally fatal—only 5 to 8 percent of those infected die—can

be spread by a single organism compared with the several thousand organisms required to spread most diseases.

Psittacosis or parrot fever, a highly infectious disease, has recently appeared in Baltimore. If untreated, it can cause 10 percent fatalities. . . .

Experimenting with these diseases is not as simple as it might seem. So-called incapacitating biological agents—that is, diseases that are generally not lethal—are very frequently lethal to the very young, the old, and the sick. And a disease that may start out in a mild form when first tested, may become a highly deadly disease if it spreads. A disease that is mild may mutate as it passes through several different areas and become more deadly. . . .

Statement from The Department of the Army: It is the objective of the United States to develop and maintain a defensive chemical-biological (CB) capability so that U.S. military forces could operate for some period of time in a toxic environment if necessary; to develop and maintain a limited offensive capability in order to deter all use of CB weapons by the threat of retaliation in kind; and to continue a program of research and development in this area to minimize the possibility of technological surprise. This policy on CB weapons is part of a broader strategy designed to provide the United States with several options for response against various forms of attack. Should their employment ever be necessary, the President would have to authorize their use. The United States does not have a policy that requires a single and invariable response to any particular threat. In the field of CB warfare, deterrence is the primary objective of the United States.

As a matter of policy, the United States will not be the first to use lethal chemical or biological weapons, but we are aware of the capabilities these weapons place in the hands of potential adversaries. For this reason, it is important to carry on our R.&D. program in CB, not only to provide necessary equipment, such as detection and warning devices, but to define and quantify more fully the potential threat to our country from these weapons, and the hazards involved if they are ever used against the United States.

It should be emphasized that CB is not just one system but many systems, all with different effects and different uses. Some chemical weapons are designed to kill, others are designed to incapacitate. Other chemical systems include riot control agents, herbicides, smoke and flame. The United States does not consider these latter systems as weapons to fall within the purview of the Geneva Protocol of 1925.

—*From Hearings of House Subcommittee, Conservation and Natural Resources, May 20, 1969.*

Environmental Impact of Nuclear Testing

By MINNEAPOLIS TRIBUNE

The government has made light of environmentalists' fears that the underground test of a five-megaton nuclear warhead on Am-

chitka Island in the Aleutian chain will trigger a major earthquake in that geologically unstable area. The Atomic Energy Commission (AEC) contends that an explosion with a force of at least 25 megatons would be necessary for that to happen. An amphitheater-sized cavern will be blasted from the rock more than a mile underground, a crater 100 feet deep and a nearly a mile wide will be formed in the center of the island, sections of the earth will fall into the sea—but the AEC says there probably won't be any major earthquake.

We hope that the AEC is right, but we fear that if it is, it will be of small comfort to the wildlife in the test site area, some species of which are already on the endangered list. The blast will kill some of the bald eagles and peregrine falcons (the latter near extinction in North America) that live on Amchitka, and their nesting sites will be damaged, if not destroyed. The sea lions might escape much injury, since they frequent rocks on the south end of the island, away from ground zero. But the sea otters won't be so lucky. The explosion will cause excess pressures of 300 pounds a square inch to travel through the water to a point five miles out from the island's shore line. Any sea otters diving for food when the pressure-wave hits will die of lung damage. Some on the surface will suffer ruptured eardrums—and they'll soon die of starvation because the subsequent pain will keep them from diving for food. Most of the fish near Amchitka probably won't be hurt, but opponents of the test fear that radiation leakage will ruin the \$60-million Alaska salmon-fishing industry.

One of the most disturbing things about the test, however, has been the indifference to public opinion manifested by the Nixon administration during the discussion of it. Canadian and Japanese protests have had no effect. Environmentalists' objections have been dismissed. The public has been told that "overriding requirements of national security" make it necessary to test a warhead that, in all likelihood, will never be deployed. Why? Well, the public doesn't have enough information to understand, so why explain? . . .

*—From Editorial, MINNEAPOLIS TRIBUNE, © November 2, 1971.
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National Interest and Atomic Tests

"All preliminary indications suggest that the Cannikin test has been conducted both successfully and safely.

"Cannikin has been a proof test of the warhead for the Spartan missile, a weapon which is part of the Safeguard ABM and is intended to strengthen the U. S. deterrent posture. This proof test permits us to introduce the Spartan warhead into the inventory while minimizing the likelihood of a defective warhead. I believe at this point that the final results of Cannikin will permit the AEC to certify the Spartan warhead for introduction into the stockpile within the appropriate deployment schedule. . . .

There has been no detectable release of radioactivity to the marine or surface environment as a result of Cannikin. Measurements will continue for a number of years. . . .

No large earthquake was triggered by the detonation, although hundreds of aftershocks much smaller in recorded magnitude than the shock wave from the explosion were registered in the vicinity until collapse to the surface of the cavity created by the detonation

The dike of a pond holding drilling mud, about 4.7 miles from ground zero, developed cracks from Cannikin ground motion, and an estimated 5,000 cubic yards of drilling mud escaped before the cracks were sealed. Most of the mud flowed into a small creek that empties into the Pacific Ocean, with the inflow being at a point about one and a half miles from the ocean. On the basis of other experience it must be assumed that organisms in the affected portion of the creek were destroyed, and that life will return to that part of the stream within a few years.

At this time, observed effects on species of living things on and near Amchitka indicate that no permanent harm will result from the test to any population of mammals, birds, fish, other marine life, or plant life. To date, searches of the sea shores of Amchitka have located 14 dead sea otters. . . . Two additional injured otters were observed from helicopters. . . . Another two abandoned small otter pups were seen and not recovered. It is assumed that all these died, making a total of 18, of which 16 were on the Pacific side and two on the Bering side. It is not believed likely that more explosion-injured sea otters will be found.

Four dead seals were found in the sweeps, and all were autopsied. All apparently died from overpressure. . . .

Hundreds of dead fish were found on beaches, most of them greenling which live around the kelp beds fringing Amchitka. . . .

Autopsies of 16 dead birds found on the island indicated that all but one died of the effects of the explosion, seven from overpressure and eight from vertical acceleration. . . .

Three or four bald eagle nesting sites along the Bering coast apparently were lost in cliff falls, and two on the Pacific coast. . . .

Hundreds of dead freshwater fish were found on the borders of small lakes near Cannikin ground zero. . . .

-From Press Release, U. S. Atomic Energy Commission, November 19, 1971.

The Modification of Our Weather

By HERMAN POLLARD AND ROBERT M. WHITE

Mr. Pollard: . . . Experiments on the modification of clouds through seeding with various agents started shortly after the end of the Second World War and by the early 1960's it seemed likely

that this technology, when further developed and when more answers were known, might some day produce vast benefits through enhancing rainfall and might also pose new tasks in international relations. At about the same time, the first efforts to moderate the intensity of hurricanes through seeding were initiated. It was these developments, nearly 10 years ago, that caused the State Department to establish its watching brief on weather modification; and responsibility for maintaining this brief was assigned to the Bureau which I head.

In the period 1968 to 1970 several developments occurred which made it clear that weather modification was progressing beyond the early experimental phase and was approaching the stage where at least a few types of human intervention in weather processes might well be approaching operational status. Among these developments I will mention three in particular:

The studies of the Department of Interior showed that proper seeding of winter clouds might enhance the snow-pack in the Colorado River Valley by perhaps 20 or 30 percent. Such an achievement would enhance the fresh water available in the whole river valley during the spring and summer months.

The experiments of Dr. Joanne Simpson and her associates at the NOAA (National Oceanic and Atmospheric Administration) laboratory in Miami produced manifold increases in the rainfall from isolated tropical cumulus clouds.

The experiments known as "Project Stormfury" aimed at moderation of violent hurricanes appear to have produced their first substantially positive results in a series of experiments on Hurricane Debbie of 1969.

Mr. White: There is no doubt in my mind that we have only just begun to develop the potential for human betterment by the artificial modification of natural environmental processes. Our capabilities for consciously affecting environmental processes are still primitive. Our scientific understanding on which such capabilities are based is limited. Nevertheless, we have reached a point where some of our techniques are useful. This is true in the field of weather control. In other fields, such as earthquake control, only the theoretical possibilities are under examination. Because it is in the field of weather control where the widest spread activity is now going on, I would like to focus my remarks on the status in this field.

What is the nature of the weather control capabilities we now possess? Almost all capabilities are based on the concept of seeding cloud systems with agents such as silver iodide, dry ice or salt, thereby providing nuclei which affect the precipitation processes.

We now have the ability to disperse cold fog where water droplets are below freezing. This technology is widely used at airports around the world where cold fog occurs with some regularity. In the case of warm fog, present experimental techniques have shown some promise, but no reliable and practical warm fog dispersal system now exists. Success with warm fog dispersion can make it possible to deal successfully with the remaining airports having significant fog problems.

We now have the ability to modify rain or snow in certain geo-

graphical regions and under certain meteorological conditions. Experiments in Florida with tropical cumulus and with clouds formed on the upslopes of mountains in the West indicate that rain can be increased in a reasonably predictable way when cloud conditions are right. In other types of clouds and in other geographical locations, the results have been mixed and in some cases precipitation appears to have been suppressed when the opposite effect was intended.

As we learn more about precipitation processes, we can look forward to the time when we can deal successfully with a broader range of meteorological phenomena and over wide geographical areas. In time, we should be able to increase precipitation in a predictable manner for the purposes of increasing soil moisture, replenishing reservoirs and the like. As our knowledge expands we can look forward to the time when it will be possible to redistribute precipitation in order to make more efficient use of the moisture reaching the ground. We can also visualize the possibility that one day our science and technology may enable us to suppress unwanted precipitation. One need only recall the recent Rapid City and east coast flood disasters to realize the tremendous benefits to be derived from such a capability.

However, the full potential of precipitation enhancement, redistribution and suppression will not be realized until we learn a great deal more than we know now about the physics and dynamics of clouds and cloud systems. Improved nucleation theory, better techniques for delivering the seeding agents to the target area, more accurate and reliable instrumentation, carefully designed and controlled field experiments and the development of computer models to simulate the actual microphysical and dynamic changes that take place during seeding, all are needed before we can say we understand the processes involved and can routinely obtain predictable and beneficial results.

Hail and lightning suppression through weather modification is showing increasing promise. The Russians and French are obtaining results in suppressing hail to reduce crop damage and our U.S. experiments in hail suppression are now maturing. The United States has reported some success with experiments to reduce forest fires through lightning suppression techniques.

We are exploring the possibility of modifying hurricanes and other severe storms. Theoretical and experimental work in the last decade have placed our approach to these problems on a sound scientific basis with encouraging results. In experiments in hurricane Debbie of several years ago, the maximum winds in the hurricane eyewall were reduced by as much as 30 percent. . . .

The potential benefits of weather modification are widely recognized in many nations, and work in this field is spreading. The following countries have active programs to determine means for increasing precipitation when and where it is needed: Australia, Brazil, India, Israel, Japan, Mexico, the Philippines and the U.S.S.R. Countries actively engaged in studying means for dispersing fog include Canada, France and the U.S.S.R. Countries having active hail suppression research programs include Canada, France, Italy, Japan and the U.S.S.R.

Perhaps just as important, many nations are now actively seeking assistance in the use of weather modification techniques to alleviate water shortages and reduce hail-induced crop losses. The United States has assisted these countries in a variety of ways. We have loaned experts who act as consultants to the meteorological agencies of the countries concerned. These experts study the climatology of the area and advise on weather modification techniques and field programs. In other cases, private U.S. weather modification companies have entered into contracts with foreign countries for the purpose of augmenting precipitation and/or suppressing hail. Countries that have received U.S. assistance or have contracted with the U.S. companies in recent years include Afghanistan, Argentina, Brazil, Chile, Cyprus, Ethiopia, Iran, Kenya, Libya, the Philippines and Taiwan. . . .

-From Hearings of Senate Subcommittee on Oceans and International Environment, July 26-27, 1972.

For certain meteorological conditions the evidence is persuasive that it is possible to increase precipitation by substantial amounts and on other occasions to decrease precipitation by substantial amounts.

There is ambiguous evidence that the effects of seeding may influence precipitation at points 100 to 200 kilometers from the site of the seeding. This matter must be clarified.

It now appears possible to acquire the additional knowledge necessary to predict the effects of seeding on a wide variety of cloud types and systems (convective, orographic, stratiform, migratory storm systems, etc.) in different geographic areas from reasonably realistic computerized cloud models.

Supercooled fog can be dissipated on an operational basis.

There is encouraging evidence that hail can be suppressed.

There is encouraging evidence that the intensity of winds in a hurricane can be reduced.

There is evidence that further development will lead to operational techniques for decreasing the frequency and duration of cloud-to-ground lightning discharges, with a subsequent reduction in forest fires.

Advances in remote-sensing techniques are the first steps toward methods to modify tornadoes.

No completely accepted technique yet exists for dissipating warm fog, but the potential economic benefits and the encouraging prospects of such a capability warrant further research.

The prospects of inadvertent modification of weather and climate by changing the chemical composition of the atmosphere, the particle concentration, or by the discharge of heat are so real, and so likely to be realized within a matter of decades, that a major program of research appears to be warranted.

Weather modification issues now reach to the stratosphere. It has been suggested that exhaust emissions from SST's may decrease the ozone concentration at high altitude and lead to an increase in

ultraviolet radiation at the Earth's surface. Fortunately, the way appears clear to resolve this question before SST's are operational.

—From THE FIRST ANNUAL REPORT to the PRESIDENT and CONGRESS by The National Committee on Oceans and Atmosphere, June 30, 1972.

Weather Modification and Environmental Destruction

By GILBERT GUDE

... Concerning arms control implications, it appears that this country has precipitously blundered into a most unwise use of technology. The arms control implications are staggering. As Senator Cranston and I pointed out to the Secretary of Defense on June 15, 1971;

"Using weather modification as a military tool opens the door to a vast unknown category of warfare. Although techniques are primitive today, experience with other military systems suggests that refinements inevitably will come."

We are taking a step that demands gifted foresight and prophecy beyond our powers. For this reason alone, caution—even abstention—should be our guide.

Why should we be so alarmed about a technique that is not nearly as lethal as other forms of warfare? There are several reasons: First, there are distinct command and control problems associated with geophysical warfare and weather modification in particular. We simply do not have effective short- or long-term control over the climates of the world. We can create certain disturbances, but as civilian experiments have shown, control is not very precise. In a military environment, control over the results of weather experimentation is even more uncertain. . . .

We must also consider that the use of weather modification is potentially indiscriminate. Unlike other weapons, the winds and seas are not so directable that we can discriminate between one target and another. By their nature, they are areawide weapons. We cannot flood only military targets or cause drought in areas producing only military rations. The technology will be used against people regardless of their uniform or occupation. Weather modification will inevitably strike civilians harder than nearby military objectives. Will rain along the Ho Chi Minh Trail succeed where years of bombing has not? And what price will it exact from the agrarian societies along its path, both friend and foe?

The issues of command, control, and discrimination highlight another disturbing characteristic of weather modification, the difficulty of detection. Unlike other weapons, it may be possible to initiate military weather modification projects without being detected. In other words, the military results may not be visibly tied to the initiating party. This raises the possibility of the clandestine use of geophysical warfare where a country does not know if

it has been attacked. The uncertainty of this situation, the fear of not knowing how another country may be altering your climate, is highly destabilizing. . . .

In recent years we have come to realize that many of our activities in society have undesirable environmental consequences. Too often we learn of these after much of the damage has been done. The area of weather modification has potential for causing considerable environmental harm and I regret the fact that the public has been kept ignorant of what developments are taking place.

The Department of Defense has testified that it is conducting a study of climate modification known as Project Nile Blue. Under this study a sophisticated computer called the Illiac IV will further advance our technological knowledge of how to change weather patterns. Obviously, such knowledge can be used for offensive military purposes.

Today there exists the strong likelihood that we have artificially increased rainfall in Indochina. Obviously, this activity can be significantly destructive. Floods and intense downpours can do more than hinder troop movements; they kill people and they destroy property.

Such operations are still at a primitive stage; however, beyond making rain, we just look to the possibility of prolonging droughts, redirecting storms and hurricanes and setting off earthquakes with small nuclear devices. Even the possibility of permanently changing the world's climate by tampering with the polar ice cap is no longer in the realm of science fiction. . . .

Many authorities have testified that weather modification is a Pandora's box. This is true in more ways than one. We not only do not know how far our technology will take us, but we also have no idea of what may be the permanent consequences of the experiments we have conducted so far. The top secret acidic rain, produced by the so-called hygroscopic seeding, is a prime example. Has it changed the acid content of the soil? Does it destroy plant life or alter the ecosystem of the area on which it falls?

-From Hearings of Senate Subcommittee on Oceans and International Environment, July 26-27, 1972.

Weather Modification and Defense

By JOHN S. FOSTER, JR.

. . . The possibilities inherent in weather modification techniques to support military operations have been the subject of discussion for more than 20 years. For a number of these years the Department of Defense has been conducting several modest research and development programs relating to various forms of weather modification. . . .

Weather modification research on the part of the Department of Defense stems principally from two major interests. The first of

these is the enhancement of our own operational posture through weather modification activities. Two examples of this type of employment are: The suppression of hail and lightning (to reduce damage to military property and equipment, and to increase safety of operations), and the dissipation of fog at airfields and within harbors (to enhance operational safety of aircraft and ships). The other interest is an understanding of what capabilities our potential enemies may possess in the area of weather modification operations. For example, the Soviets have demonstrated a technique for hail suppression. Suitably designed artillery shells are fired into cumulus clouds to reduce hailfall from those clouds. These experiments are conducted by Soviet military personnel using military equipment.

DOD research in this area is conducted in the laboratory and in the field. The field efforts, usually joint ventures with one or more other government agencies, are all carefully controlled operations, based on the best available theoretical knowledge. One example of fruitful field research has been the investigation of precipitation augmentation. This research has established a significant point: There is no known way to "make rain" under all conditions. When the proper meteorological conditions prevail (that is, when clouds capable of producing natural rain exist), it is a relatively simple matter to increase the amount of rain which will fall. The amount of increase is frequently of the order of 30 to 50%. . . .

The field capabilities of the Department of Defense have been utilized on several occasions in attempts to alleviate severe drought conditions. In 1969 at the request of the Government of the Philippines, the Department of Defense conducted a six months' precipitation augmentation project in the Philippine archipelago. The Philippine Government considered the undertaking so successful that they have subsequently taken steps to acquire an independent capability to augment rainfall on an annual basis when required. Similarly, we have just completed a one-month project in Texas at the request of the Governor of that State. The operation appears to have been moderately successful in alleviating Texas' severe water shortage. On the other hand, attempts to solve similar problems in India and at Midway Islands were near or total failures due to the absence of suitable cloud formations.

—From a letter in the record of Hearings of Senate Subcommittee on Oceans and International Environment, July 12, 1971.

Ecological Warfare

By RICHARD A. FALK

In Indochina during the past decade we have the first modern instance in which the environment has been selected as a "military" target appropriate for comprehensive and systematic destruction. Such an occurrence does not merely reflect the depravity of the

high-technology sensibilities of the war-planners. It carries out the demonic logic of counterinsurgency warfare, especially when the insurgent threat is both formidable and set in a tropical locale. Recourse to deliberate forms of environmental warfare is part of the wider military conviction that the only way to defeat the insurgent is to deny him the cover, the food, and the life-support of the country side.

Under such conditions bombers and artillery seek to disrupt all activity, and insurgent forces find it more difficult to mass for effective attack. Such policies have led in Indochina to the destruction of vast tracts of forest land and to so-called "crop-denial programs." The U.S. Government has altered tactics in recent years, shifting from chemical herbicides to Rome Plows as the principal means to strip away the protective cover of the natural landscape, but the basic rationale of separating the people from their land and its life-support characteristics persists. Such policies must be coupled with the more familiar tenets of counterinsurgency doctrine which seek to dry up the sea of civilians in which the insurgent fish attempt to swim. This drying up process is translated militarily into making the countryside unfit for civilian habitation. To turn Indochina into a sea of fire and compel peasants to flee their ancestral homes was consciously embodied in a series of war policies including "free-fire zones," "search and destroy" operations, and the various efforts to move villagers forcibly into secure areas. Therefore, it is important to understand the extent to which environmental warfare is linked to the overall tactics of high-technology counterinsurgency warfare, and extends the indiscriminateness of warfare carried on against people to the land itself. Just as counterinsurgency warfare tends toward genocide with respect to the people, so it tends toward ecocide with respect to the environment.

It may be more than coincidental that at the historical moment when we are in the process of discovering the extent to which man's normal activities are destroying the ecological basis of life on the planet that we should also be confronted by this extraordinary enterprise in Indochina of deliberate environmental destruction. These conscious and unconscious tendencies need to be linked in any adequate formulation of the world order challenge confronting mankind. It is also worth noting that so far, at least, the target area of environmental warfare is the Third World, a sector of world society that has largely disavowed the relevance of the ecological agenda to its schedule of priorities. Environmental warfare is a dramatic reminder of the extent to which the planet as a whole must mobilize a response to the ecological challenge to sustain life on earth and beat back reversions to barbarism emanating from the "advanced" regions and applied to those that are relatively "backward." It is a form of dangerous provincialism for the countries of Asia and Africa to call for "benign neglect" when it comes to this subject-matter; perhaps the relevance of ecological issues can be grasped more clearly by Third World leaders and peoples in relation to environmental warfare.

-From Hearings of Senate Subcommittee on Oceans and International Environment, July 26-27, 1972.

- ERIC HOFFER - *Longshoreman, Philosopher and Essayist.*
GILBERT GUDE - *U.S. Representative from Maryland.*
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